Visual Rules Suite - Modeler

Modeling Guide

Version 5.4

Bosch Software Innovations

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Modeling Guide: Version 5.4

Visual Rules Modeling Guide, Version 5.4
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Chapter 1. Overview

1.1. Organization of this Manual

This manual is the "Modeling Guide" for Visual Rules. It consists of four chapters:

- Getting started
- Concepts
- Tasks
- References

The "Getting started" chapter contains a simple step-by-step introduction into Visual Rules. If you are new to Visual Rules you should read this first. You will learn how to setup Visual Rules, create a rule project, write rules and execute and test them. For users of previous versions of Visual Rules this may also be a good way to get accustomed to the new user interface of Visual Rules version 4.

The "Concepts" chapter explains and defines the concepts of Visual Rules rule models. Here you can learn for example what a rule is, what a rule package is, and how they relate to each other. You don't have to read this chapter from beginning to end. It was organized to be usable as a reference with many links that help you to navigate from one concept to other related concepts.

The "Tasks" chapter contains many step-by-step procedures for different tasks you may want to perform when using Visual Rules. For example, it tells you how to create a new rule, how to reuse other rules and how to enter rule expressions and many things more. Again, this chapter was written and organized to be used as a reference for when you want to do a specific task. So all the procedures that have to do with similar concepts are grouped together. That way it should be easier to find them.

The "References" chapter contains detailed information about all the wizards, dialogs, menus, properties tabs etc.

1.2. Support

For support visit **http://www.visual-rules.com** or send an email to **support@visual-rules.com**.

For information about the built-in support request sending facility see Section 4.21, “Sending a Support Request” [188].

1.3. Using the Visual Rules Online Help

In Visual Rules Modeler select the menu entry **Help > Help Contents** to open the online help. All Visual Rules related information can be found in the **Visual Rules** section.

Browse topics in the **Contents frame** ( ) on the left. Click on a topic to have it displayed. Use the **Back** and **Forward** buttons to navigate within the history of viewed topics.

Icon	Description
	This button directs you to the previous page. It is displayed both on the upper right and on the bottom left corner of every page. In the bottom left corner the name of the previous page is displayed beneath the button if the current page is not the first page in the document.
	This button directs you to the next page. It is displayed both on the upper right and on the bottom right corner of every page. In the bottom right corner the name of the next page is displayed beneath the button if the current page is not the last page of the document.
	This button directs you to the index page that is directly above the current page in the topic hierarchy. It is displayed on bottom of every page in the center but if the current page is not in the highest level of the hierarchy.
	This button directs you to the index of the manual you are currently reading. It is displayed on the Bottom of every page in the center.

1.3.1. Searching

To quickly locate topics on a particular subject in the documentation, enter a query in the **Search** field (you can use * or ? wildcard characters). Use the **Search** frame ( ) to display the Search view. You can narrow the **scope** of your search by selecting only the sections you are interested in.

To search only Visual Rules topics click on **Search scope** and select **Search only the following topics**. Now press **New...**. In the dialog that appears enter a **List name** e.g. Visual Rules, tick **Visual Rules** in the **Topics to search** list. Now press **OK** in both dialogs.

1.3.2. Synchronizing

After you run a search and find a topic you were looking for, click either the **Refresh / Show Current Topic** button ( ) or **Show in Table of Contents** button ( ) to match the navigation tree with the current topic. You might also find it useful to synchronize after following in-topic links.

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Chapter 2. Getting Started

2.1. Learning the Basics

2.1.1. Layout of Visual Rules Modeler

The Visual Rules Modeler provides views and editors to model, execute and test rules. Figure 2.1, “Overview Visual Rules Modeler” [3] shows the main Visual Rules views and editors.

Each view is a window you can close, resize, minimize, or maximize. You can also change the location of views or rearrange the set of views to fit the way you work.

Read the Eclipse Workbench User Guide for more information about working with views and perspectives.

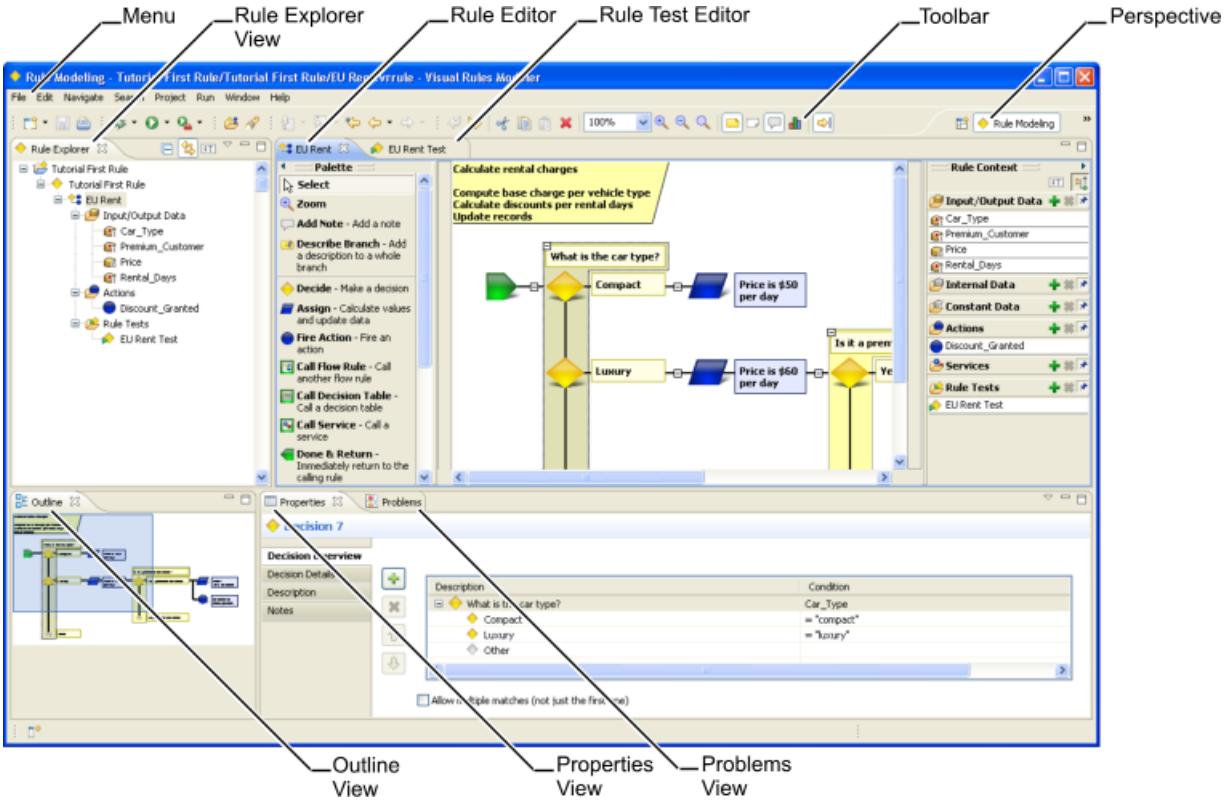


Figure 2.1. Overview Visual Rules Modeler

Element	Description
Menu	The menu gives you access to many features of Visual Rules and the underlying Eclipse platform.
Toolbar	The toolbar contains icons for common tasks. Availability of icons depends on the selected perspective and selected view or editor.
Rule Editor	The rule editor is used to view and edit a rule. Most of the rule authoring process takes place here. It is a sophisticated graphical editor with a tools palette (left) and rule context palette (right) (see Figure 2.2, “Visual Rules Rule Editor” [5]). You can open multiple rules at the same time.
Rule Explorer	The **Rule Explorer** is the central view for working with projects. It lists all the projects and their contents (data elements, files, models etc.). You can create, edit, delete or move resources in this view and organize the structure of your rule project.

Element	Description
Outline	The **Outline** view displays a compact representation of the rule being edited. A blue box is drawn around the currently visible part of the rule in the rule editor. You can navigate through the rule by moving this box around. The rule editor will scroll its viewport accordingly.
Properties	The **Properties** view shows information and settings for the currently selected element. Whenever you select an item in the **Rule Explorer** or in the rule editor, the **Properties** view will be updated and shows the properties of this element. The properties of an element are usually grouped on several tabs. Navigate to a specific tab by clicking on the tab name displayed on the left side.
Problems	The **Problems** view displays a list of all current errors and warnings that Visual Rules has detected in the rule projects. It describes the error, says which rule contains the error and provides the location of this rule. You navigate to the problem location by double-click on an entry in the **Problems** view.
Perspectives	The perspectives define the initial set and layout of Visual Rules views. Each perspective provides a set of functionality and defines what appears in certain menus and toolbars. Visual Rules offers different perspectives for different tasks. The **Rule Modeling** perspective is used for rule modeling tasks. The **Rule Integration** perspective is meant for developers who integrate rules into an application, connect rules with existing object models or extend Visual Rules with additional functions or actions.

2.1.2. Modeling Rules

Visual Rules provides an advanced collaboration platform between business analysts and IT.

The business analysts model and maintain the business rules on their own. They use the expressive and easy to use graphical user interface of Visual Rules. It is possible to draft the rules in a first step using just the graphical elements and descriptions. This is very powerful for specifying the requirements and discussing what will be realized in the business rules model.

In a second step the business analysts finalize the rules and insert expressions into the existing rule elements. Visual Rules supports this with the intuitive use of the rule editor. For example, inplace editing capabilities eliminate the need to ever leave the visual environment.

The “rules first”-approach makes it easy for the business user to concentrate on the modeling of the business logic. It is not a prerequisite to define the data items first that will be used during rule modeling. Instead, data elements can be created automatically during rule authoring.

After finalizing the rule modeling, Visual Rules provides a powerful testing functionality to guarantee high rule quality.

When the business analysts complete the rule modeling process, the rules are handed over to IT. The technical experts don't need to know about the modeled business rule logic and just have to deal with the integration of the rule model.

For a start we focus on the **Rule Modeling** perspective and on working with the rule editor. For rule modeling tasks most of the rule authoring process takes place in the rule editor and for basic modeling of rules it is sufficient to see just this editor.

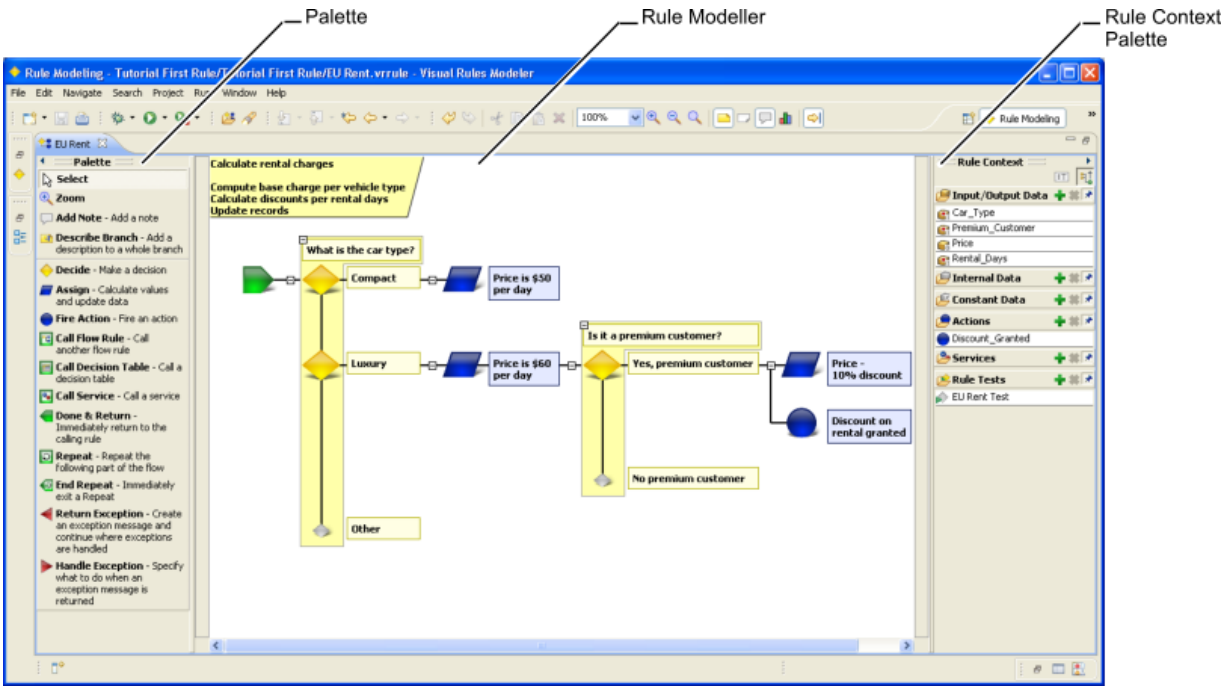


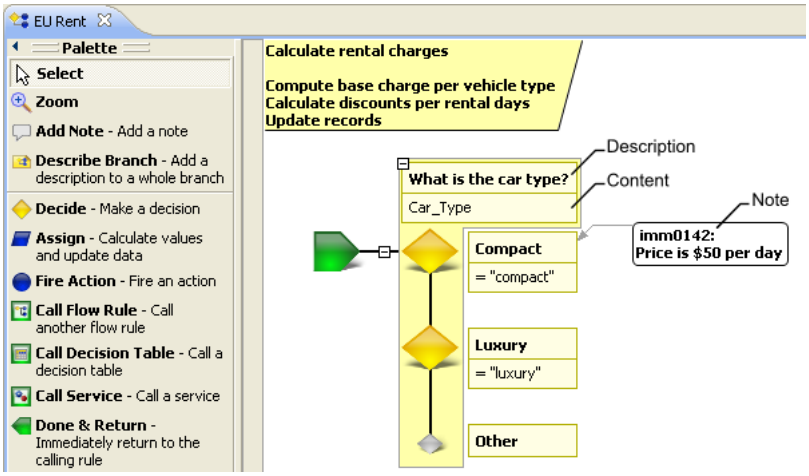
Figure 2.2. Visual Rules Rule Editor

Element	Description
Rule Editor	The rule editor is used to view and edit a rule. Here you can model your rule graphically, insert new rule elements from the palette and use data elements, actions and services from the rule context palette.
Palette	The rule editor palette shows all the elements that you can use for rule modeling. You can drag elements from the palette and drop them into the rule editor. The palette also contains tools for zooming, adding notes and adding branch descriptions. You find more information about the rule elements here: Section 3.5, “Flow Rule Element” [31]
Rule Context Palette	The rule context palette displays and gives quick access to data that is available for this rule. This includes data elements, actions and services and also a list of all rule tests. Data elements, actions, services and tests can be created, renamed or deleted and the **Properties** can be opened (by double-clicking).

There are special toolbar icons for the rule editor where you can change the appearance of the so called flow rule.

The elements in the rule editor can be turned on/off in the drop down menu of the View icon (), which can be accessed by clicking the arrow next to the icon. Among other things, the display of descriptions ( ), contents ( ) or notes ( ) can be toggled here.

You can also modify the maximum height and width of rule elements. This can be done via the increase and decrease buttons in the toolbar ( ). These settings are also available in the **Preferences** (Window > Preferences > Visual Rules > Flow Rule Editor).



You can change the zoom level of the rule with the corresponding icons

in the toolbar.

2.2. Tutorial 1: Modeling Your First Simple Rule

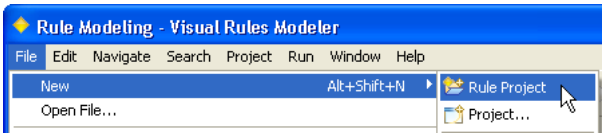
This section provides step-by-step instructions for building, drafting and modeling a new flow rule that calculates the price for the rental of a car. After this first tutorial you will have a complete rule that can be executed and tested in the next tutorial “Testing Your First Rule”.

In this tutorial, you perform the following tasks:

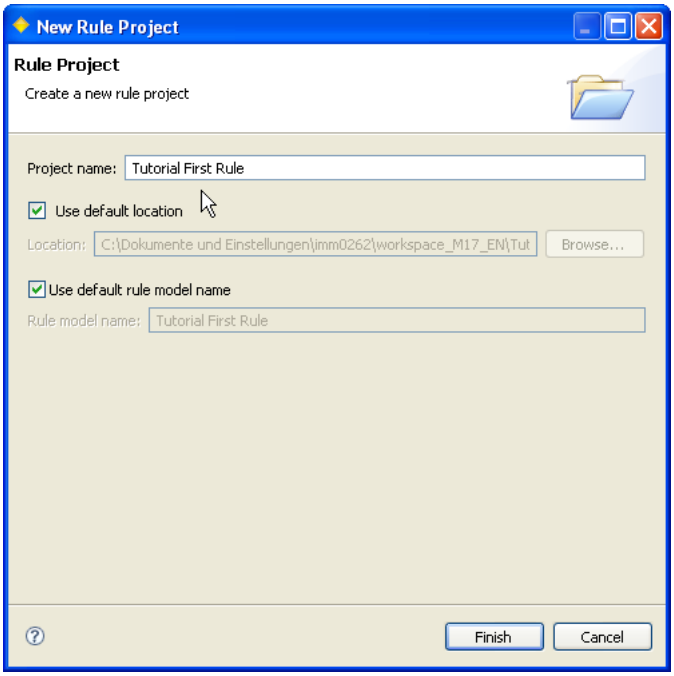
- Create a new rule project
- Create a new flow rule
- Draft your first flow rule
- Finalize your first flow rule

2.2.1. Task 1: Create a New Rule Project

1. Select the menu item **File > New** and select the **Rule Project** entry from the list.



2. The **New Rule Project** wizard appears.
3. Enter the name `Tutorial First Rule` for the rule project.



4. Press **Finish** to create the new rule project.

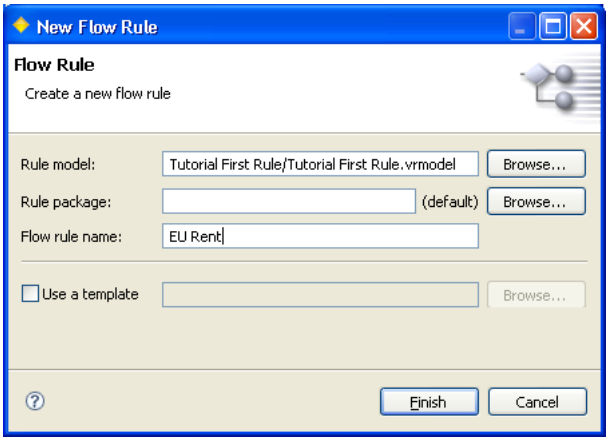
When a new rule project is created, Visual Rules automatically creates a new rule model inside. Per default the new rule model has the same name as the rule project.

2.2.2. Task 2: Create a New Flow Rule

1. Right-click on the rule model included in the new rule project.

2. Select **New Element > Flow Rule** from the context menu.

3. The **New Flow Rule** wizard appears.



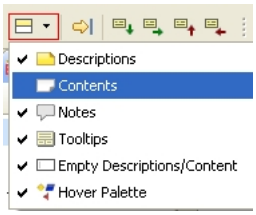
4. Enter the **Flow rule name** `EU Rent`.

5. Press **Finish** to create the new rule. The new flow rule will open automatically in the flow rule editor.

2.2.3. Task 3: Draft Your First Flow Rule

In this task you will draft the rule logic. The graphical elements representing the logic will be created and descriptions will be added to them.

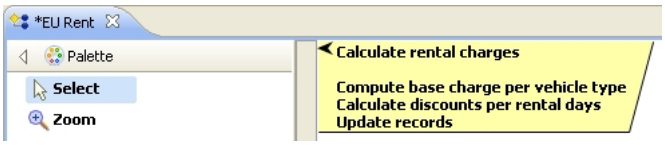
For drafting the rules in the first step, switch off the display of the rule element contents, so that just the descriptions are shown. In order to do this, open the drop down of the View ( ) toolbar button, then deselect Hide/Show Contents ( ).



Now just the descriptions of the rule elements are shown.

2.2.3.1. Describing the Rule

Insert a description for your flow rule by double-clicking on the description field to edit its contents.



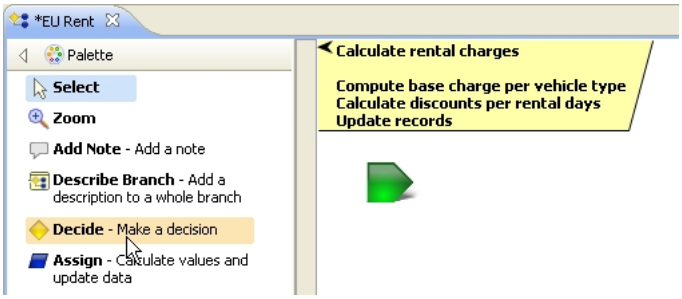
Use **Alt**+**Enter** to start a new line.

2.2.3.2. Adding a new Decision

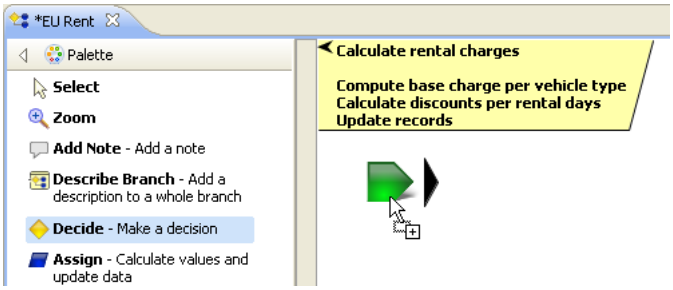
The rental for the car depends on the car type, therefore you need to decide what the car type is.

Insert a new decision per drag&drop from the palette:

1. Select the rule element **Decide** in the palette by clicking on it.


*EU Rent
Palette
Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Calculate rental charges
Compute base charge per vehicle type
Calculate discounts per rental days
Update records

2. Now, move the mouse over to the start element in the flow rule. A black arrow will appear to show you where the new element will be added.


*EU Rent
Palette
Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Calculate rental charges
Compute base charge per vehicle type
Calculate discounts per rental days
Update records

A stop (⃠) icon indicates that the rule element cannot be added at this location.

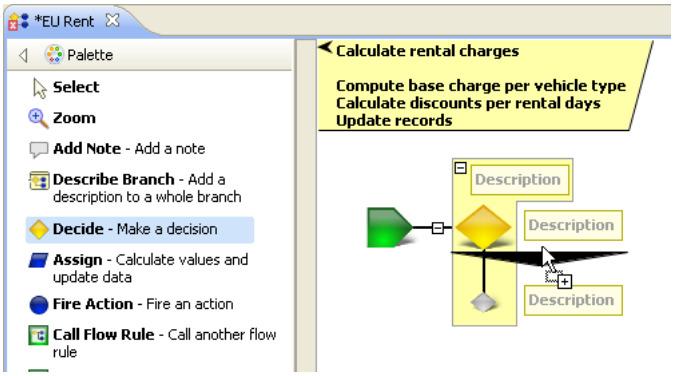
3. When you see a black arrow, click again and the new rule element will be inserted.

2.2.3.3. Adding a new Decision Condition

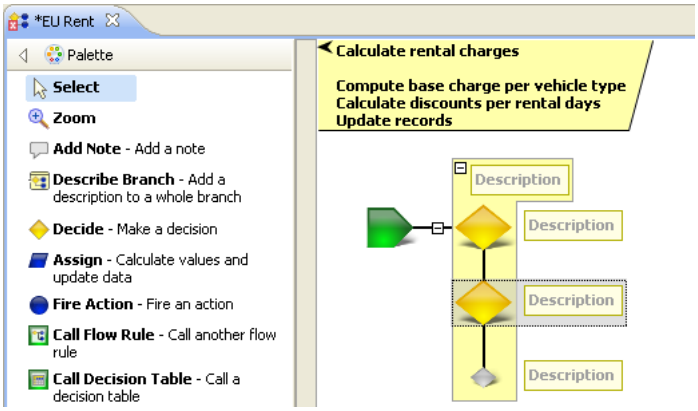
In this example you will check three different car groups, compact, full-size or other. For this you need to insert a new condition to your decision:

1. Select again the **Decide** element on the palette.

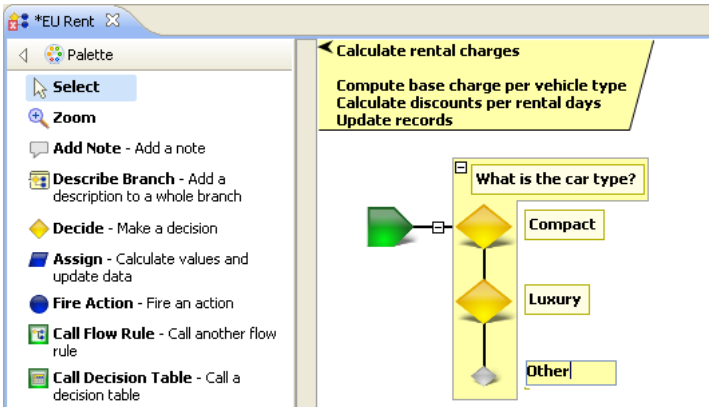
2. Move the mouse over the decision where you want to add another condition. A black arrow appears pointing up or down to indicate where the new condition will be inserted.



3. Click again. The condition is inserted.



4. Describe the decision element by double-clicking on the description fields, like in the picture below.

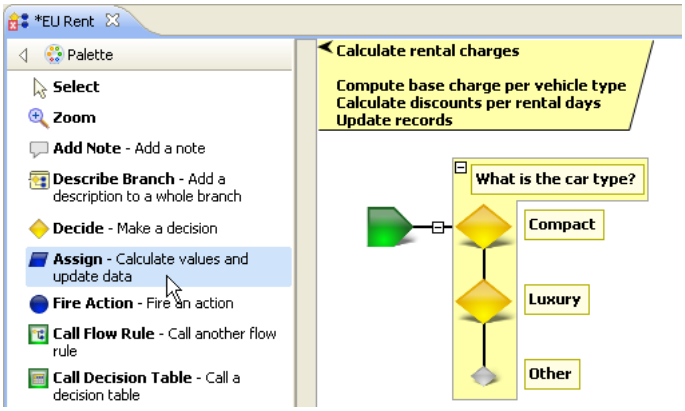

*EU Rent
Palette
Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Fire Action - Fire an action
Call Flow Rule - Call another flow rule
Call Decision Table - Call a decision table
Calculate rental charges
Compute base charge per vehicle type
Calculate discounts per rental days
Update records
What is the car type?
Compact
Luxury
Other

The car type is checked for the conditions compact, luxury and other.

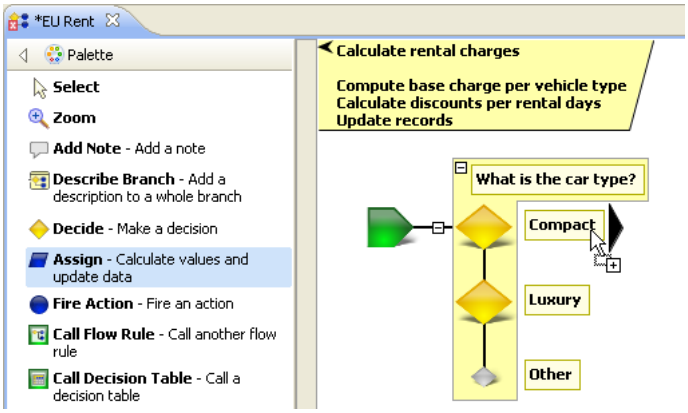
2.2.3.4. Adding a new Assignment

Insert an assignment after the condition for compact car type to calculate the price for this type.

1. Select the **Assign** element in the palette by clicking on it.

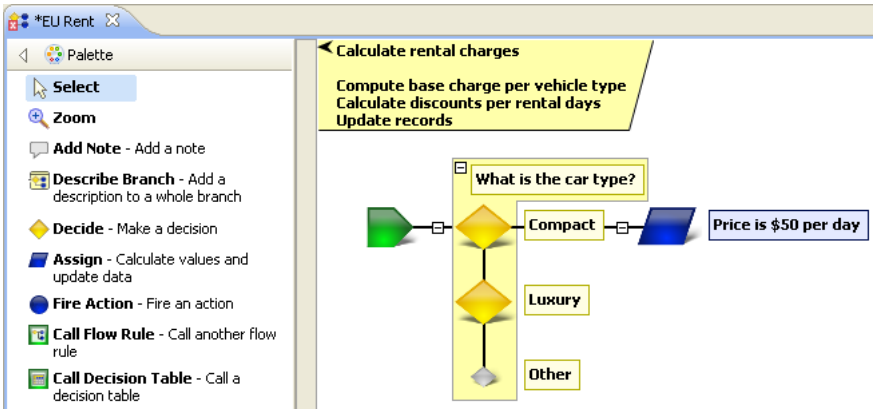

*EU Rent
Palette
Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Fire Action - Fire an action
Call Flow Rule - Call another flow rule
Call Decision Table - Call a decision table
Calculate rental charges
Compute base charge per vehicle type
Calculate discounts per rental days
Update records
What is the car type?
Compact
Luxury
Other

2. Now, move the mouse over an existing element in the flow rule. A black arrow will appear to show you where the new element will be added. This can be either before, after, above or below the existing rule elements. Accordingly, the black arrow will point to the left, to the right, up or down. Move the mouse until the arrow points into the direction you want. Here to the right of the condition "Compact".

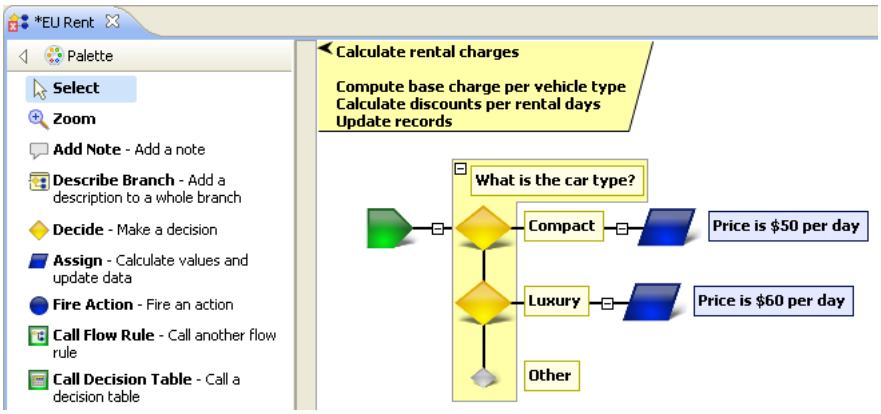

*EU Rent
Palette
Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Fire Action - Fire an action
Call Flow Rule - Call another flow rule
Call Decision Table - Call a decision table
Calculate rental charges
Compute base charge per vehicle type
Calculate discounts per rental days
Update records
What is the car type?
Compact
Luxury
Other

3. When you see a black arrow, click again and the new assignment will be inserted.

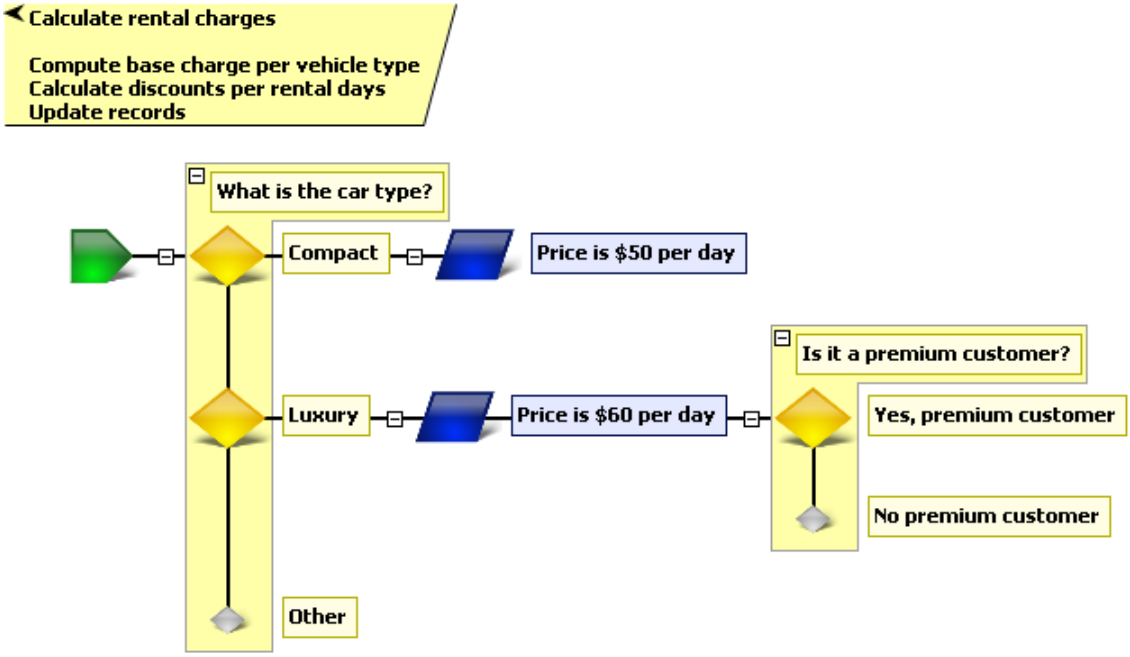
4. Insert a description for the assignment element to document that the price will be calculated here.


*EU Rent
Palette
Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Fire Action - Fire an action
Call Flow Rule - Call another flow rule
Call Decision Table - Call a decision table
Calculate rental charges
Compute base charge per vehicle type
Calculate discounts per rental days
Update records
What is the car type?
Compact
Price is $50 per day
Luxury
Other

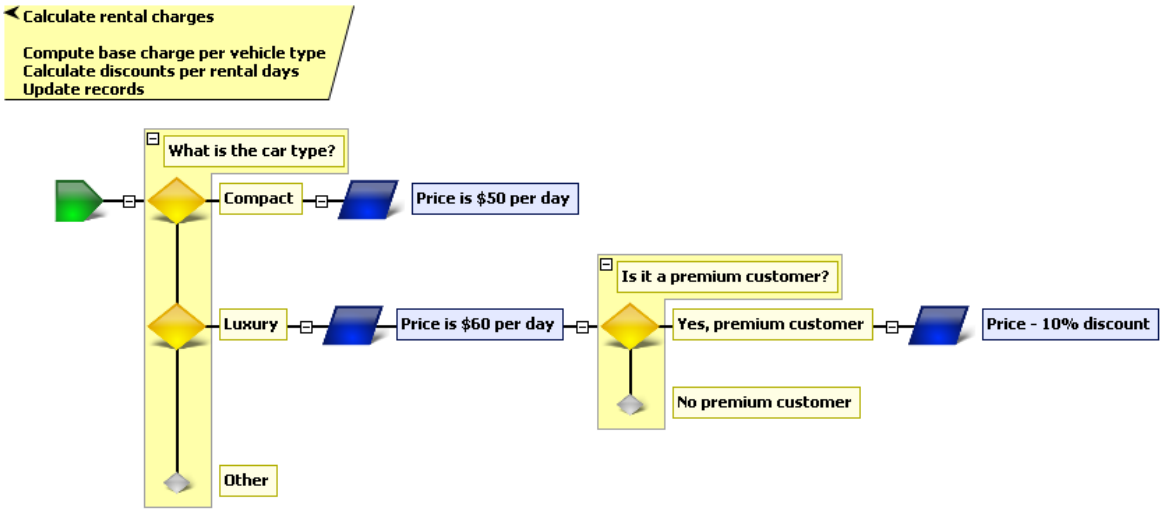
5. In the same way as before insert an assignment for calculating the price of the luxury car group.


*EU Rent
Palette
Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Fire Action - Fire an action
Call Flow Rule - Call another flow rule
Call Decision Table - Call a decision table
Calculate rental charges
Compute base charge per vehicle type
Calculate discounts per rental days
Update records
What is the car type?
Compact
Price is $50 per day
Luxury
Price is $60 per day
Other

6. In the case of a luxury car there should be a discount granted for premium customers. In the first step insert a decision to check if the customer is a premium customer. Insert the new decision like described above. You don't need to insert another decision condition this time.



7. In the second step insert an assignment where the new price after the discount will be calculated.

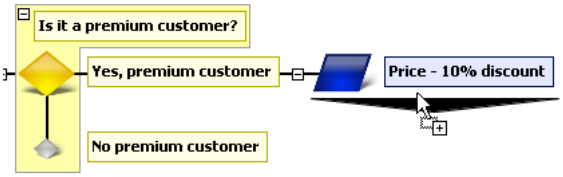


2.2.3.5. Adding a new Action

Finally, an action should be fired when a discount was granted. With this action you can see in the result if a discount is included in the calculated price.

1. Select the **Fire Action** element in the palette by clicking on it.

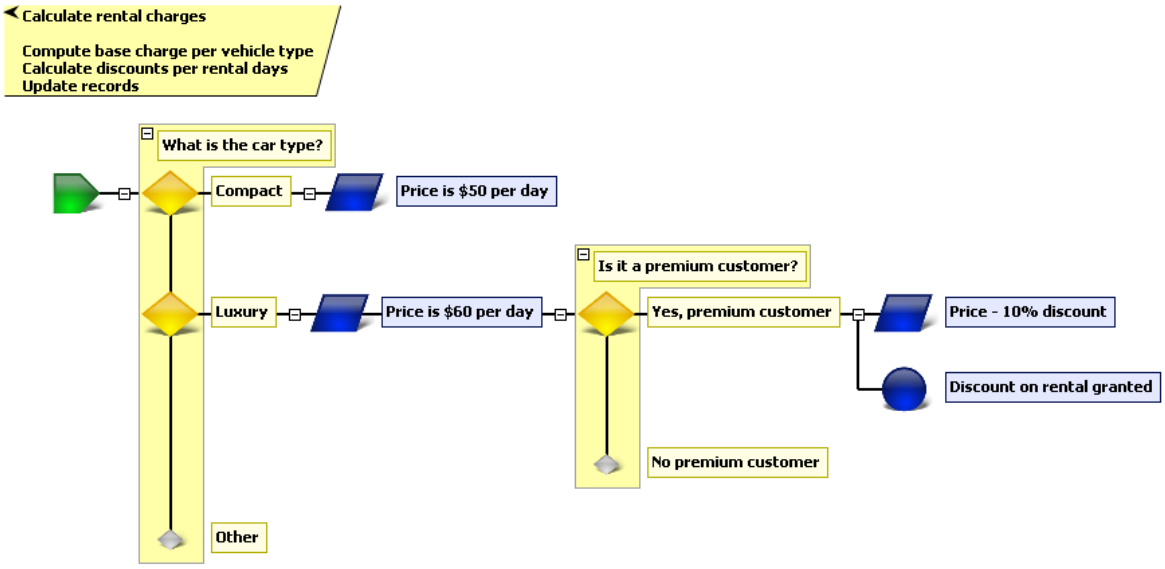
2. Now, move the mouse over an existing element in the flow rule. Move the mouse until the arrow points down below the previously added assignment.



3. When you see a black arrow, click again and the new flow rule element will be inserted.

4. Insert the description `Discount on rental granted` for the action element.

   The drafted flow rule should look like the picture below.



Save your rule by clicking the Save button ( ) in the toolbar. You can also press **Ctrl**+**S**.

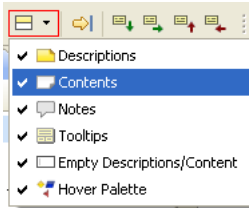
2.2.4. Task 4: Finalize Your First Flow Rule

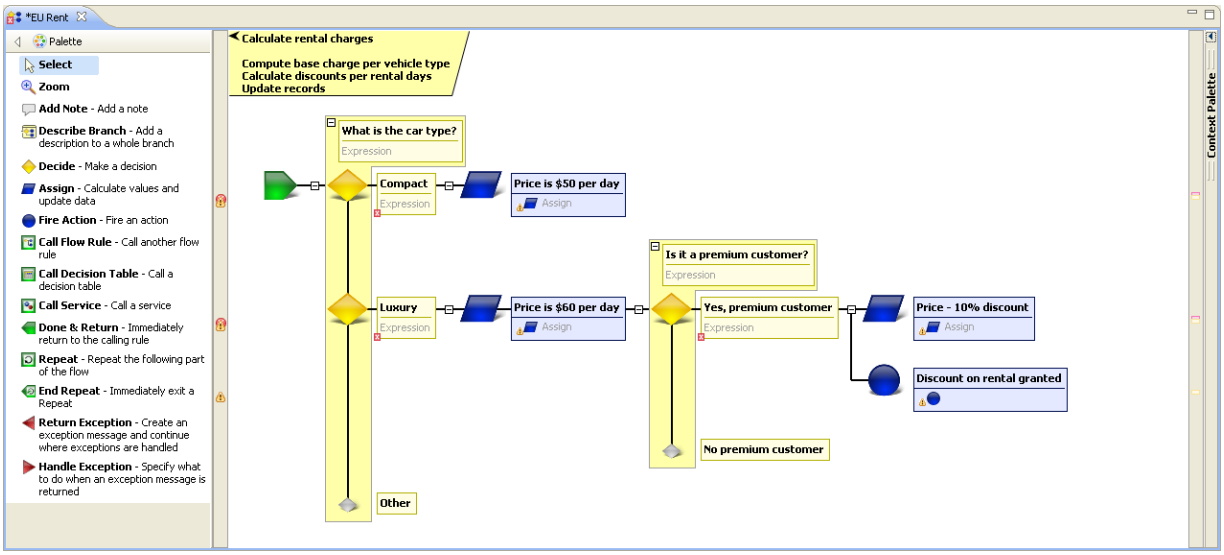
Now you have described a rule and defined what elements you need for the calculation.

It is time to finalize your rule and insert the expressions that should be executed during the rule execution.

2.2.4.1. Enabling the Content

Switch on the display of the flow rule element contents. Activate the **Contents** entry ( ) in the drop down menu of the View toolbar button. Now the contents of the flow rule elements are also shown.




*EU Rent
Palette
Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Fire Action - Fire an action
Call Flow Rule - Call another flow rule
Call Decision Table - Call a decision table
Call Service - Call a service
Done & Return - Immediately return to the calling rule
Repeat - Repeat the following part of the flow
End Repeat - Immediately exit a Repeat
Return Exception - Create an exception message and continue where exceptions are handled
Handle Exception - Specify what to do when an exception message is returned
Calculate rental charges
Compute base charge per vehicle type
Calculate discounts per rental days
Update records
What is the car type?
Expression
Compact
Expression
Price is $50 per day
Assign
Luxury
Expression
Price is $60 per day
Assign
Is it a premium customer?
Expression
Yes, premium customer
Expression
Price - 10% discount
Assign
Discount on rental granted
No premium customer
Other
Context Palette

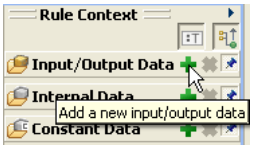
You will see error and warning markers that show where expressions have to be inserted.

2.2.4.2. Create new data elements

Every rule in Visual Rules clearly specifies the data that goes into the rule (input data) and the data that comes out of the rule as a result (output data). Create an input data element `Car_Type` that holds the value for the car type: compact or luxury.

1. You can create the data elements directly in the **Rule Context** palette of the rule editor. Expand the **Rule Context** palette by clicking on the small black arrow pointing left.

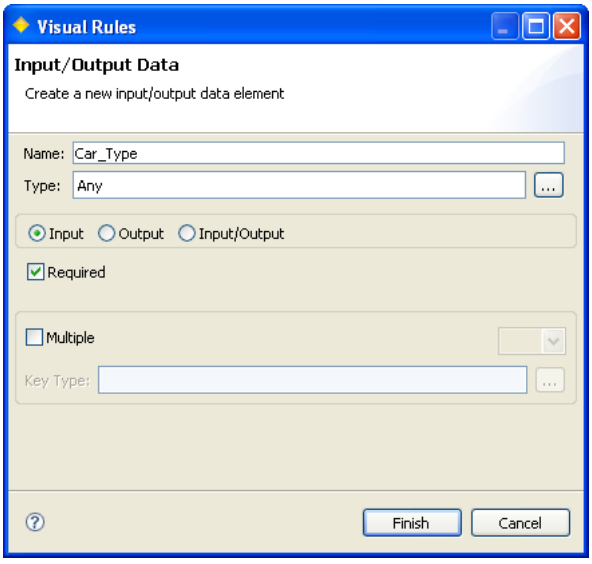
2. Click on the green plus sign of **Input/Output Data** in the **Rule Context** palette to add a new input data element.



3. The **New Input/Output Data** dialog appears.

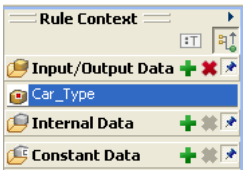
4. Enter the name `Car_Type` for the new data element.

5. Select **Input**.



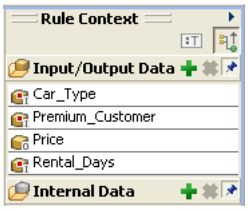
6. Create the data element by clicking **OK**.

7. The `Car_Type` data element is shown in the **Rule Context** palette under **Input/Output Data**.



Create the input data elements `Premium_Customer` and `Rental_Days` in the same way as the `Car_Type`. These elements will be used for the calculation.

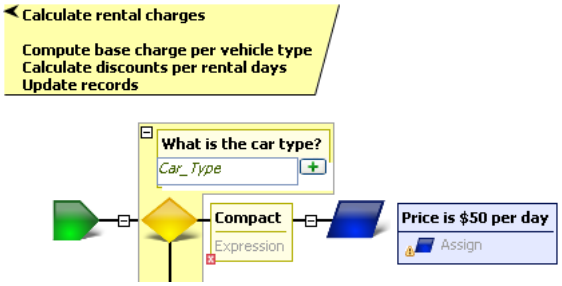
Create the output data element `Price` like the input data elements before. Since this is to act as an output, select t **Output** in the **New Input/Output Data** dialog. This element will be the result of the calculation.



2.2.4.3. Edit Rule Elements

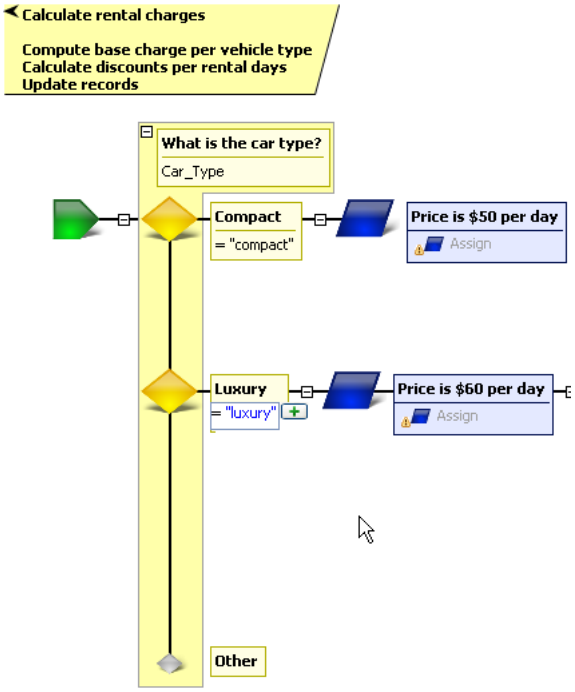
Insert the contents for the decision now and check which car type was rented.

1. Type in the name of the input data element `Car_Type` as the decision criterion at the top of the decision element.



2. Insert now the different cases for the car type.

   For the first case use `= "compact"` and for the second case `= "luxury"` like in the picture below.



3. The decision element is now complete and you should not have any error markers at your decision any more.

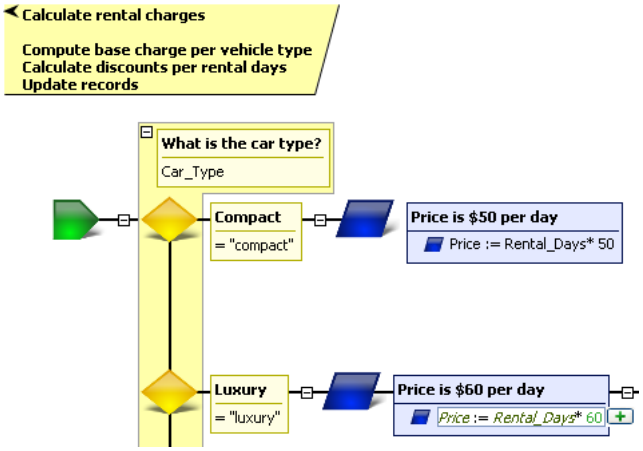
Now insert the expressions for the price calculations into the assignment elements. Calculate the price by multiplying the value of the data element `Rental_Days` with the price for the car type per day that was defined in the rule element description.

1. For compact car type use the expression:

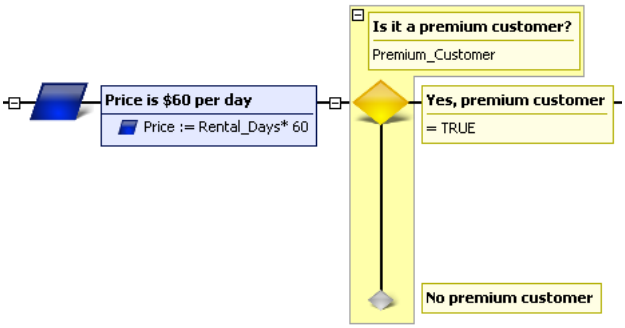
```
Price := Rental_Days * 50
```

2. For luxury car type use the expression:

```
Price := Rental_Days * 60
```



Now check if the customer is a premium customer. This is indicated by the input data element `Premium_Customer` being true.

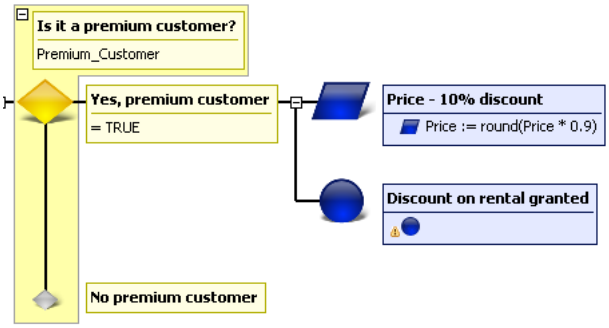


Complete the assignment for the calculation of the price – discount.

Use the expression:

```
Price := round(Price * 0.9)
```

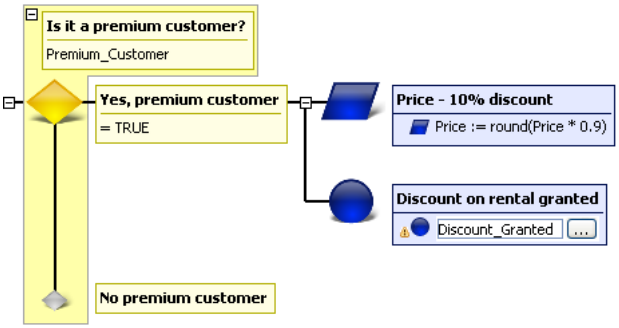
By adding `round()` to the expression, the price is rounded to the next integer.



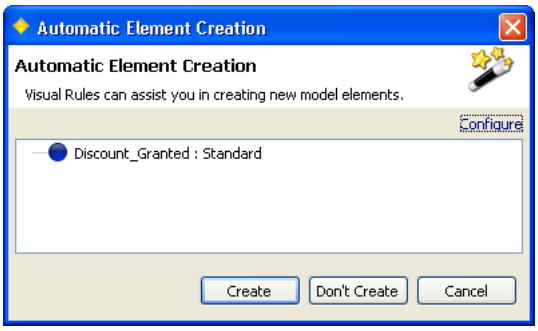
2.2.4.4. Create a new Action

For the last step of finalizing the flow rule you need an action that holds the information if a discount was granted.

1. Type in the name `Discount_Granted` in the content field of the Fire Action element in the flow rule editor.

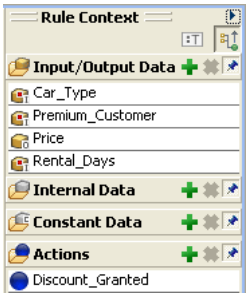


2. If you leave the content field, the **Automatic Element Creation** dialog appears.



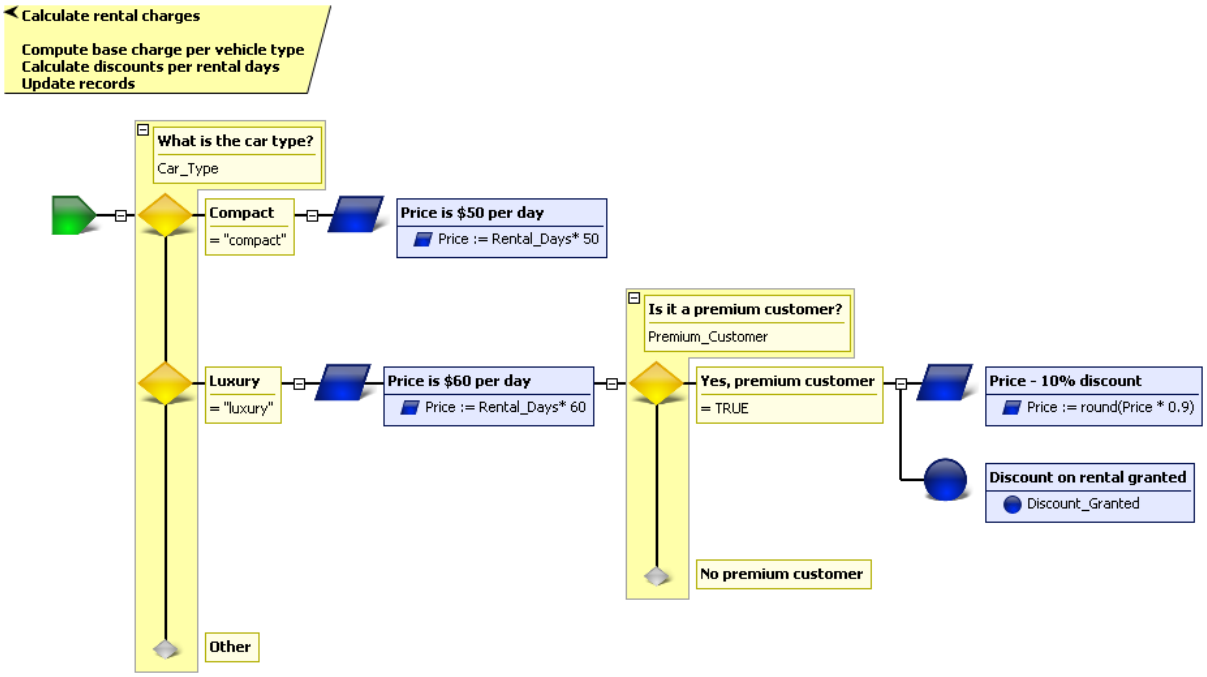
3. Confirm the creation of the action with **Create**. The new action is shown in the **Rule Context** palette under Actions.

   For further information about the automatic element creation dialog see Section 5.4.3, “Auto Creation Dialog” [218]



2.2.4.5. Conclusion

The flow rule is now finalized and should look like the rule below. There should not be any error or warning markers any more. The result of this tutorial will now be used in the next tutorial about testing of rules.

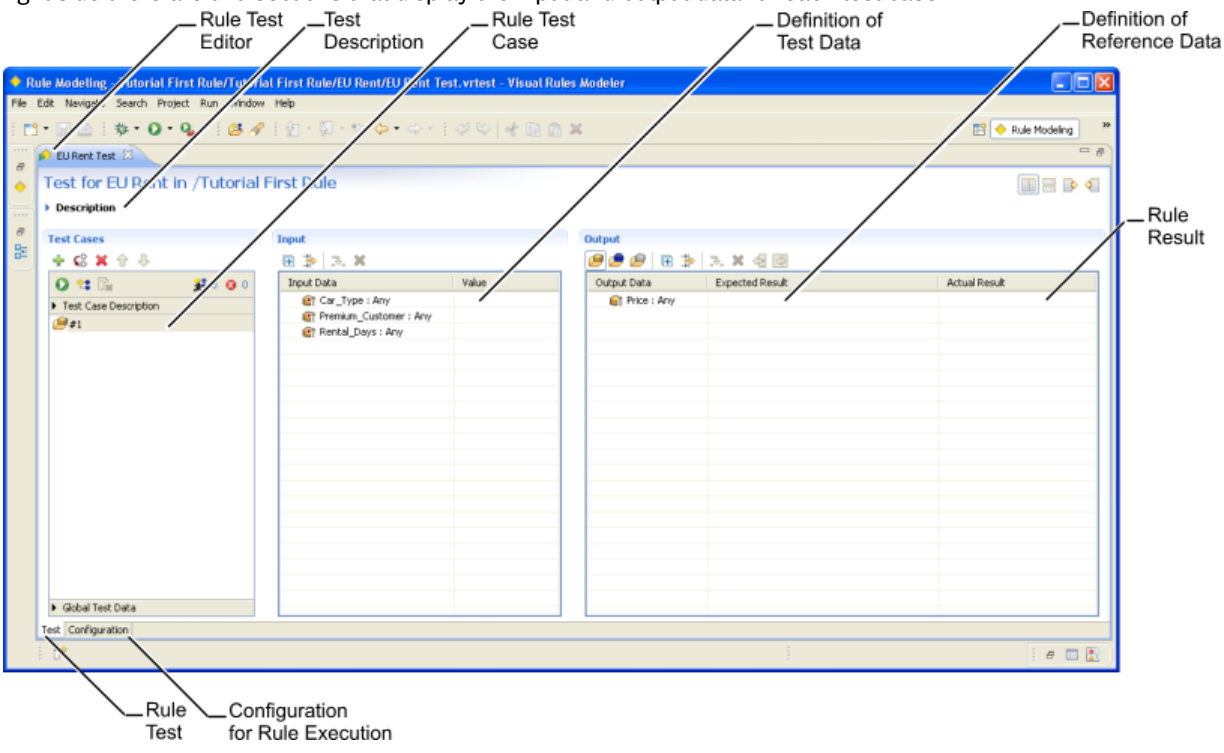


2.3. Tutorial 2: Testing Your First Rule

A rule test is a test for a specific rule. It tests the correctness of this rule by executing the rule with given input data and inspecting the results that the rule produces. One such execution is called a *test case*. A rule test can consist of any number of test cases and there can be multiple tests for the same rule.

Rule tests are defined, edited and executed with the rule test editor. It consists of two tabs. One named **Test** that includes test cases, test data, reference data and the result of the rule execution and **Configuration** with settings for the rule execution.

The rule test editor shows the test description at the top. On the left side there is a list of all test cases and on the right side there are two sections that display the input and output data for each test case.



This section provides step-by-step instructions for executing and testing a rule.

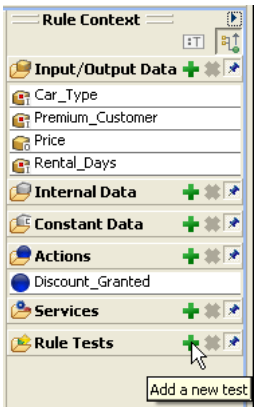
For this tutorial you need to have the flow rule modeled in tutorial 1. This will be the rule you test here. This tutorial continues exactly at the point where tutorial 1 stopped.

When you finished this tutorial you will have defined test data and expected results for a rule, executed the rule and understood how to analyze the results. In this tutorial, you perform the following tasks:

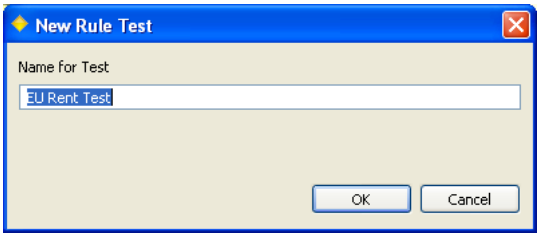
- Create a rule test
- Define input data for the test case
- Define expected results for the test case
- Specify a second test case
- Execute the rule
- Inspect the results of the test cases
- Display statistics about rule execution

2.3.1. Task 1: Create a Rule Test

1. Add a new rule test by clicking on the green plus sign near **Rule Tests** in the **Rule Context** palette of the rule editor.

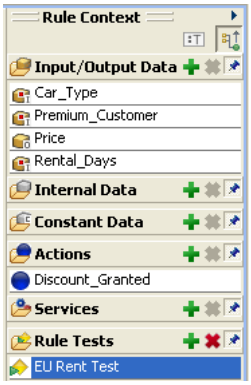


2. A dialog appears where you can specify the name of the test. Accept the default with **OK**.



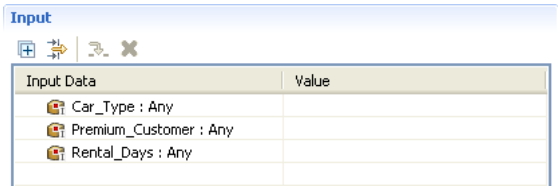
3. A new rule test is created and opened automatically in the rule test editor.

You can see the new rule test in the **Rule Context** palette of the rule editor if you go back to the rule. A rule test can be opened by double-clicking on it.

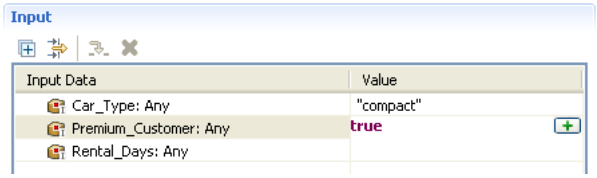


2.3.2. Task 2: Define Input Data for the Test Case

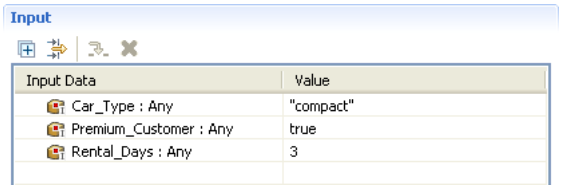
1. In the **Input** area you see the defined input data elements from the rule.



2. Insert the test data values that should be used for the rule execution by double-clicking in the value column.



3. Insert the following test data values.

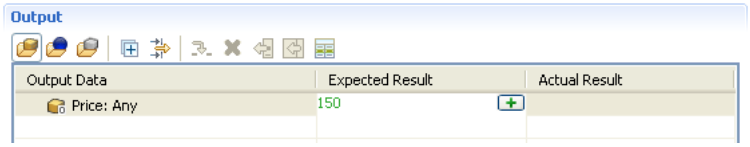


2.3.3. Task 3: Define Expected Results for the Test Case

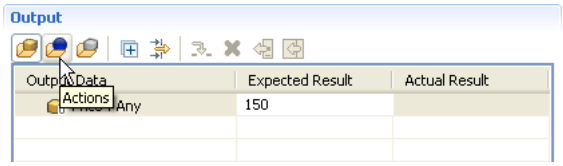
It is easy to calculate what should be the result of the rule execution for the entered test data. For compact cars the price is $50 per day and the car was rented three days. The price must be $150. For compact car types there is no discount granted and the price stays $150.

It is possible to insert the expected result and Visual Rules tests if the result of the rule execution is the same as you expect.

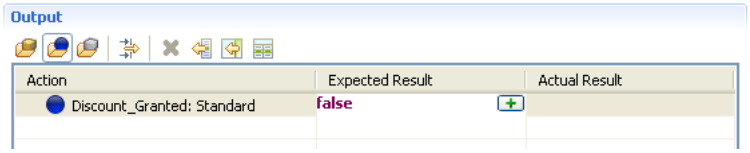
1. In the **Output** area the price is listed. Insert the expected result of 150 in the corresponding column.



2. The price is not the only result that is expected from the rule execution. The rule also fires an action that should be `true` if a discount was granted on the price. But for the first test case there should be no discount granted and the action should have the value `false`. To see the results for actions you have to switch the view of output data elements ( ) to actions ( ). Click on the actions button in the toolbar of the **Output** area.



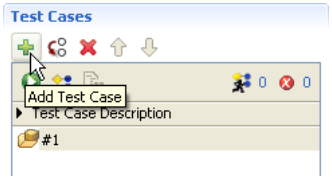
3. Now the actions are shown as output. Insert `false` as the expected result for the action `Discount_Granted`.



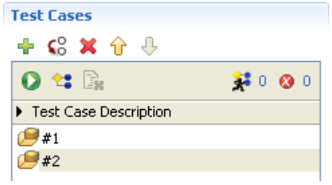
2.3.4. Task 4: Specify a Second Test Case

Create another test case for the rule where you test the calculation for luxury car and discount granted.

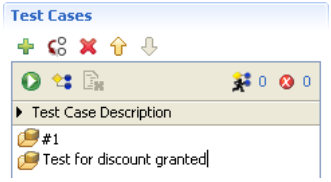
1. Add a new test case to the test by clicking the green plus sign in the toolbar of the **Test Cases** area.



2. A new test case is added.

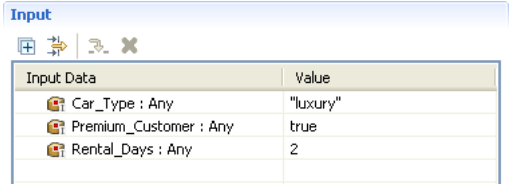


You can insert a test case description if you expand the **Test Case Description** field at the top of the list. Additionally, you can also rename the test case itself by double-clicking it.

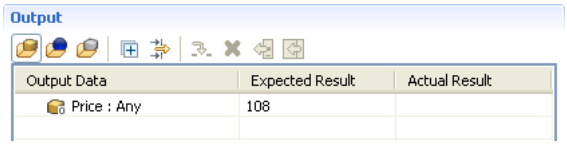


3. Insert the test data and the expected result values in the same way than for the first test case. Use the following values.

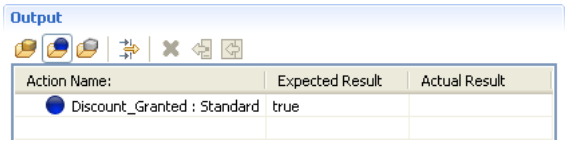
Test Data:



Expected result for output data element:

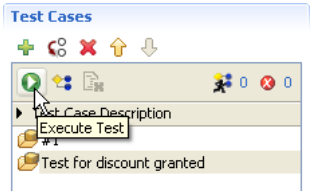


Expected result for action:

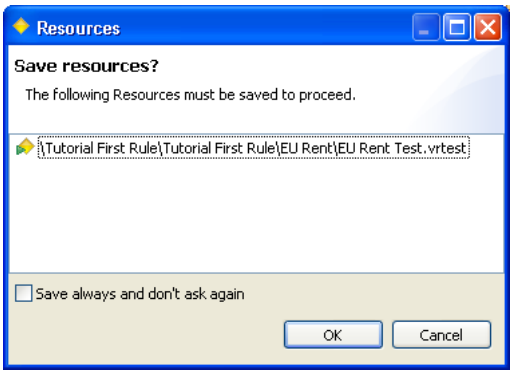


2.3.5. Task 5: Execute the Rule

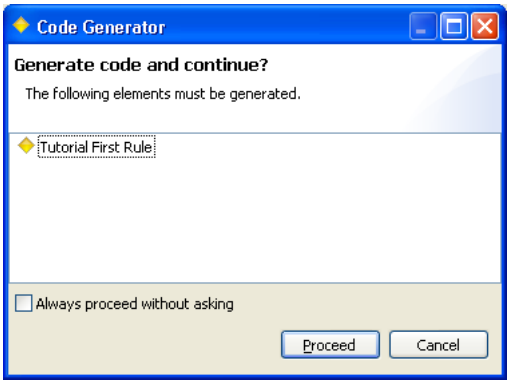
1. Click on the icon for rule execution in the **Test Cases** area and the rule will be executed.



2. If you have not saved the test a dialog will appear and ask you if you want to save resources.



3. Accept with **OK**. You should check the **Save always and don't ask again** checkbox.
4. A second dialog will appear and ask you if you want to generate code and continue.

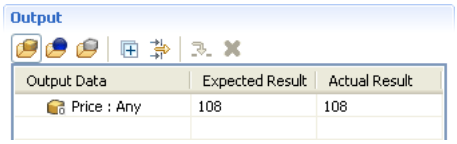


5. Accept with **Proceed**. Again you may check the **Always proceed without asking** checkbox.
6. The rule is executed.

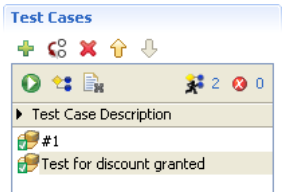
In the **Console** view you see the output of the rule execution.

2.3.6. Task 6: Inspect the Results of the Test Cases

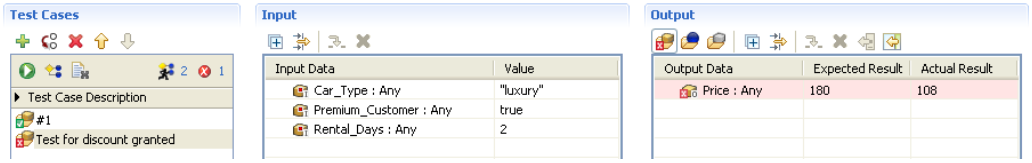
1. The result of the rule execution is shown in the column **Actual Result** in the **Output** area. For the second test case the rounded price is $108.



2. On the left hand side of the test editor there is a marker on the test cases. This marker shows that the test case was successful, which means the actual result is the same as the expected result.



If the test failed and the actual result differs from the expected result there is a red marker and the expected result field is marked red.



2.3.7. Task 7: Show Statistics of Tests

During rule execution Visual Rules can collect statistical and tracing information for later use. This is especially useful during testing and gives the user additional insight into the workings of the rules.

An important part of the statistical information is the execution counters for each rule element. These indicate how often each rule element was executed. The rule editor can display these counters next to each rule element.

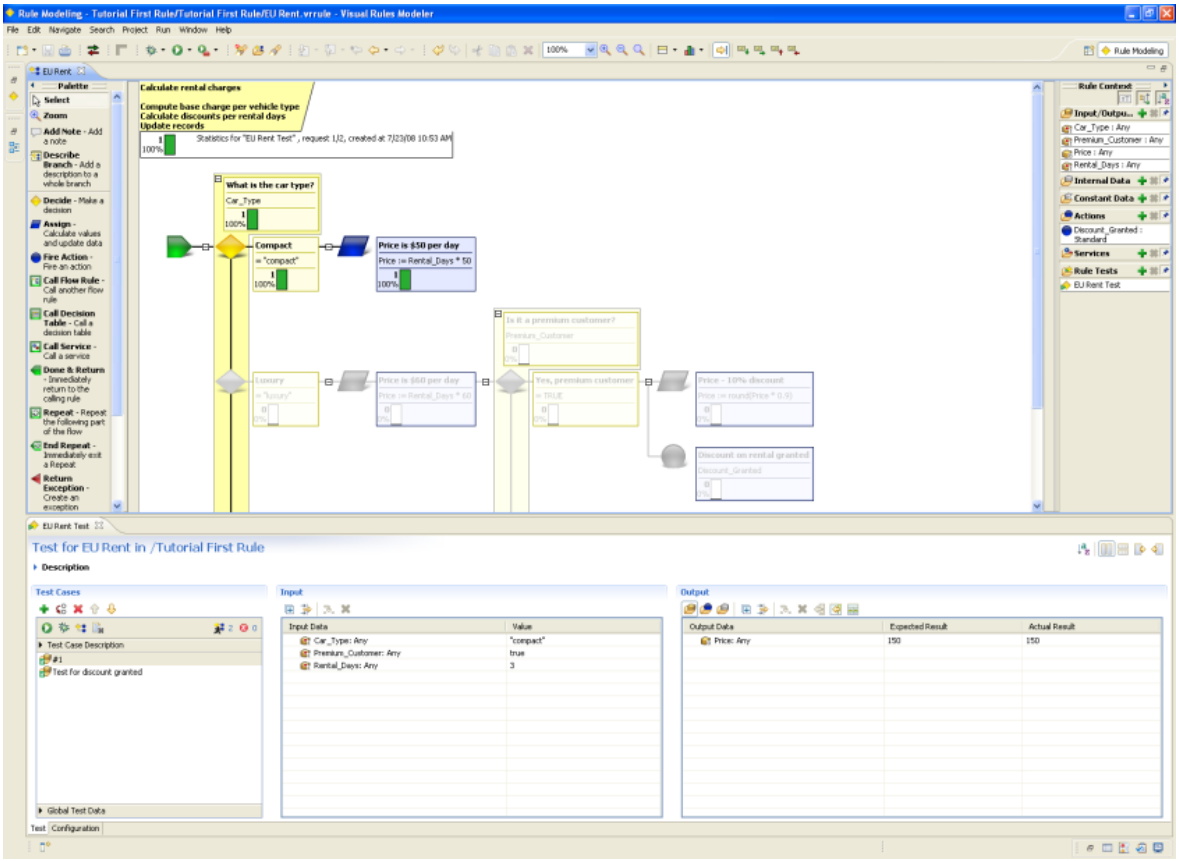
During test execution statistics are generated by default.

1. Select a test case in the rule test editor.

2. Switch from the test editor to the rule editor.

3. Show the statistics in the rule editor by selecting the Hide/Show Statistics ( ) button in the toolbar. The icon will change ( ) to indicate statistics are shown

4. The statistics are shown for the test case that you selected in the rule test editor.



The rule elements that have not been executed for this test case are grey.

The colored elements have been executed and the number indicating how often is displayed next to each rule element.

5. Show the statistics for another test case. In order to do that, select the other test case in the rule test editor. The rule editor will now show the statistics for the selected test case.

Chapter 3. Concepts

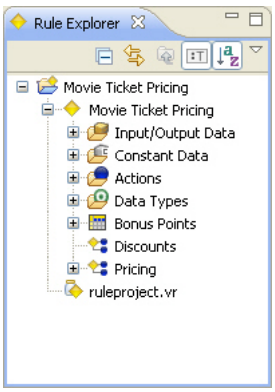
3.1. Rule Project

The workspace of Visual Rules Modeler can contain multiple rule projects, which can be seen in the **Rule Explorer** (or **Project Explorer**). A rule project contains a rule model and the file `ruleproject.vr`. Rule projects are represented by this icon:

A rule project can define dependencies to other rule projects (or libraries) in order to reuse the rules, data types, services or other elements defined there. All dependencies of a rule project are defined in the file `ruleproject.vr`. The contents of the `ruleproject.vr` file can be viewed and edited with the rule project editor.

This file has two purposes:

- specify a unique identifier for the rule project itself, consisting of a Group Id, Artifact Id and a Version.
- specify the dependencies of the rule project, i.e. Group Ids, Artifact Ids and Versions of other rule projects (or rule artifacts, or libraries) required by this rule project



Related Concepts.

- Section 3.2, “Rule Model” [25]

Related Tasks.

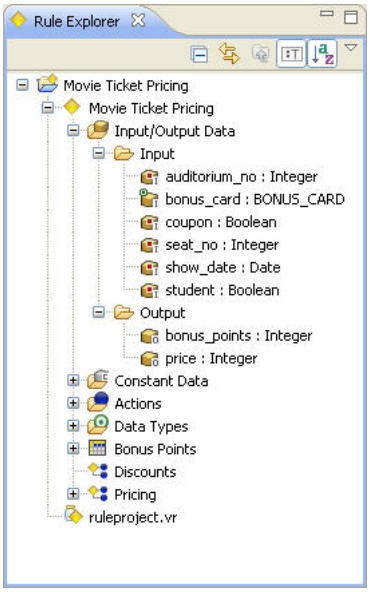
- Section 4.1.1, “Creating a new Rule Project” [89]
- Section 4.1.2, “Setting Rule Project Identifiers (Group Id, Artifact Id, Version)” [89]
- Section 4.1.3, “Defining Rule Project Dependencies” [90]

Related References.

- Section 5.5.2, “Project Explorer View” [223]
- Section 5.3.6, “Rule Project Editor” [214]

3.2. Rule Model

A rule project contains (at least) one rule model. Every rule you define is part of a rule model. A rule model can contain only a few, or maybe hundreds or thousands of such rules. Rule models and their contents are shown in the **Rule Explorer** or **Project Explorer**. Rule models are represented by this icon:



The contents of a rule model are usually subdivided into rule packages and sub packages. This is to help organize all the different rule model parts, e.g. rules, data elements, actions, data types etc. However, it is also possible to not have any rule packages. In that case all the elements are defined directly on the rule model, which is the top level package.

Related Concepts.

- Section 3.3, “Rule Package” [26]

Related Tasks.

- Section 4.2.1, “Creating a new Rule Model” [93]

Related References.

- Section 5.5.1, “Rule Explorer View” [223]
- Section 5.5.2, “Project Explorer View” [223]

3.3. Rule Package

Rules, data elements, actions and all other parts of a rule model can be collected into packages to help organizing large rule bases. Rule packages are represented by this icon:

A rule model can contain multiple rule packages, which again can have multiple sub packages each. Consequently you can think of a rule model as a tree of rule packages with the rule model being the root. This tree is also called the package hierarchy.

Organizing your rule model into packages also allows you to effectively manage dependencies within your model. This is because rules from one package cannot call rules from another package (unless it is a sub package). However, it works when a package explicitely defines another package for reuse. So rule packages also represent the level of granularity for reuse within Visual Rules.

Every package can contain data definitions, actions, data types and so on. Every such definition is automatically shared among all the rules within that package or in any of its sub packages. This allows to make things commonly accessible simply by putting them at the right level within the package hierarchy.

The rule model itself is the root of the package hierarchy. Any definitions that are made on the rule model level (top level) are globally visible and usable by every rule in the model.

For example, let's assume there is a rule `CustomerScoring` with an input data element `customer`. The input data element `customer` is defined on the rule itself, so only the rule `CustomerScoring` can access the customer data. Maybe

that rule `CustomerScoring` has become too complex and you would like to split it into smaller rules. So you create new rules `Scoring1` and `Scoring2` that both represent parts of the logic previously located in the `CustomerScoring` rule. The `CustomerScoring` rule now calls the two new rules `Scoring1` and `Scoring2`. These two also need the customer data to perform their task. Now you could either define an input data element `customer` on both new rules and pass on the customer data from the `CustomerScoring` rule to the two sub rules, or you could simply remove the `customer` input data element from rule `CustomerScoring` and define it on the rule package that contains all three rules. In that case the `customer` input data element is automatically shared among all three rules.

The following elements can be defined in every package:

Flow Rules
: Flow rules are the central and most important concept of Visual Rules. They define the behavior of the rule system. Flow rules make decisions, perform calculations or trigger actions.

Decision Tables
: Decision tables are another representation of rules in a tabular form. They are useful for rules that make many decisions based on only few inputs.

Flow Rule Templates
: Flow rule templates are blueprints for newly created flow rules. They are especially useful when you create a lot of similar flow rules.

Data
: Rules need data to perform their tasks. Therefore a rule package may also contain definitions about data which is shared by all rules in this package or any of the sub packages. Data is divided into input data, output data, internal data and constant data.

Actions
: Rules can trigger actions. The rule package contains the definitions of all the actions that rules can trigger. Depending on the type of action fired, specific things can happen. E.g. the action may send an email or trigger another process or produce domain specific results.

Services
: Rules can call services. A rule package contains the definitions of available services. Services are external to Visual Rules, i.e. they enable rules to reuse functionality available elsewhere, e.g. in legacy systems. Visual-Rules can be extended by adding custom services and service types.

Data Types
: Every data element has a specific data type that defines the possible values of the data element. There are built-in data types like `Integer`, `String`, `Date` etc. Additionally, a rule model can define user defined data types, e.g. a `Customer` type that defines the attributes of a customer: `first_name`, `last_name`, `gender`, `birthdate` and `address`.

Functions
: A rule package can define custom functions in addition to the built-in functions. These custom functions can then be used within expressions. Functions usually perform specific calculations, but they could also do other things like fetch data from an external source, e.g. a database.

Action Types
: A rule package can also define custom action types. Every action has a type that specifies what it will do when it is fired. Custom action types allow you to introduce action behavior specific to your domain.

Service Types
: Every service is of a specific service type. Visual Rules can be extended with custom service types to interface with different systems or technologies, e.g. to connect to legacy systems.

Related Concepts.

- Section 3.3.1, “Rule Package Reuse” [28]
- Section 3.2, “Rule Model” [25]
- Section 3.4, “Flow Rule” [29]

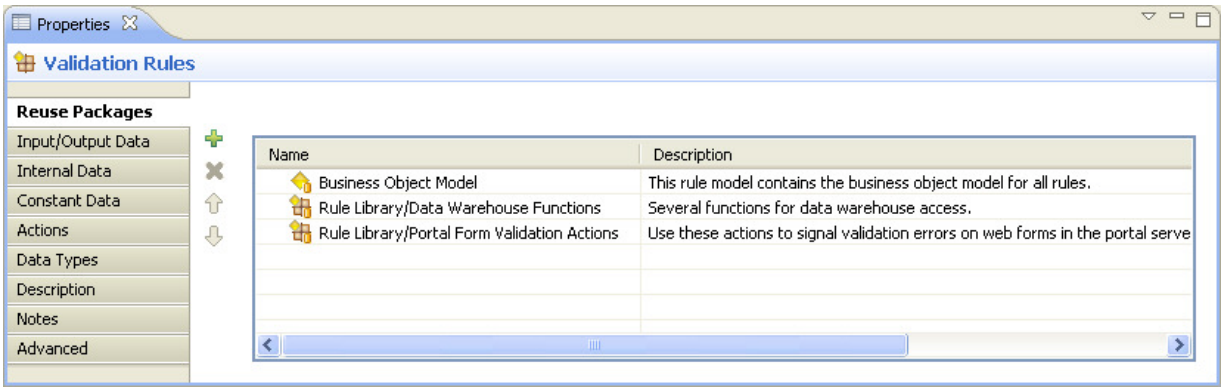
- Section 3.7, “Decision Table” [48]
- Section 3.16, “Action” [79]
- Section 3.17, “Action Type” [80]
- Section 3.13, “Data” [67]
- Section 3.14, “Data Type” [71]
- Section 3.18, “Function” [81]
- Section 3.19, “Service” [81]
- Section 3.20, “Service Type” [82]

Related Tasks.

- Section 4.2.4, “Creating a new Rule Package” [95]

3.3.1. Rule Package Reuse

A rule package is a collection of interrelated rules. Rules in a package can always call other rules from the *same* package or from sub packages thereof. But in order to be able to call rules from *other* packages, these other packages need to be explicitely defined for reuse. Every rule package can define several other packages for reuse. These packages can be from the same rule model or from another rule model. You can find the reused packages on the **Reuse Packages** tab in the **Properties** view of Visual Rules.



When a package reuses another package this does not only include rules, but also all the data types, action types, functions and constant data defined there. The following table specifies which package elements can be accessed from the same package, from any of its sub packages or from packages that reuse the package, respectively.

Table 3.1. Visibility of elements in the same or in other rule packages

Rule Package Element	Available in the same package	Available in any sub package	Available in any packages above	Available in any package (and all its sub packages) that reuses the package
Flow Rules	yes	-	yes	yes
Decision Tables	yes	-	yes	yes
Flow Rule Templates	yes	yes	-	yes
Input/Output Data	yes	yes	-	-
Internal Data	yes	yes	-	-
Constant Data	yes	yes	-	yes
Actions	yes	yes	-	-
Services	yes	yes	-	yes
Data Types	yes	yes	-	yes
Functions	yes	yes	-	yes
Action Types	yes	yes	-	yes
Service Types	yes	yes	-	yes

Related Concepts.

- Section 3.3, “Rule Package” [26]
- Section 3.2, “Rule Model” [25]

Related Tasks.

- Section 4.1.3, “Defining Rule Project Dependencies” [90]
- Section 4.2.19, “Reusing Rule Packages” [101]

Related References.

- Section 5.6.5.1, “Reuse Packages Tab” [241]

3.4. Flow Rule

A flow rule is a graphical representation of logic, consisting of computations, decisions, actions and possibly other elements. Every flow rule captures a specific part of the overall business logic of a system. Flow rules can be very small, e.g. when they make a very specific decision based on only a few facts. Flow rules can however also be rather complex when they have to make many decisions and computations based on a lot of data. Writing complex rules is usually achieved by aggregating simpler rules into more complex rules. For this purpose every flow rule can reuse other flow rules or decision tables when appropriate.

Every flow rule has a name that identifies it. All rules (including decision tables) in a rule package must have different names, so that each rule can be uniquely identified by its name and package. Rules can have the same name if they are located in different rule packages.

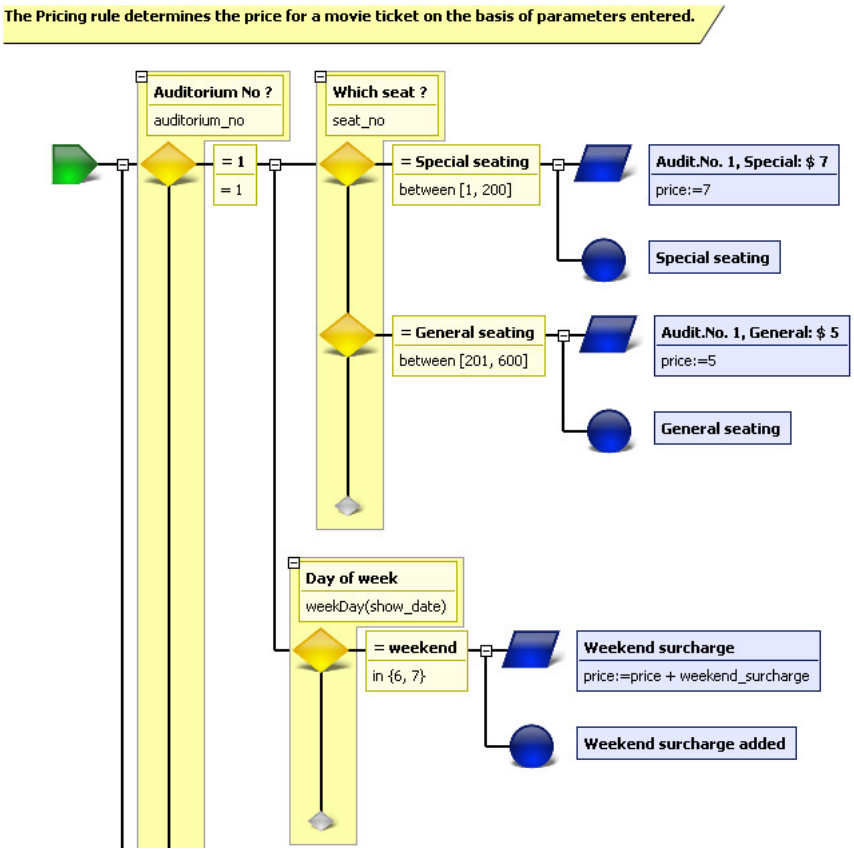


Figure 3.1. Graphical representation of a flow rule in Visual Rules

Visual Rules lets you model your rules graphically. Every flow rule is composed of individual rule elements connected to each other. The start element at the top left indicates the start point of a flow rule. This is where execution of this rule always begins. Execution then continues to the right and to the bottom, just like you read a book. Execution ends (at the latest) when all elements of a flow rule have been processed in this manner.

Every rule clearly specifies the data that goes into the rule (input data) and the data that comes out of the rule as a result (output data). Additionally, a flow rule may define data that it uses internally only (internal data or constant data).

The complete set of input, output and internal data of a rule is the sum of all data elements defined for the rule plus all data elements defined for the rule package plus all data elements defined for packages above that. In other words, a rule has access to all data elements that can be found by going up the package hierarchy starting from the rule up to the rule model (which is the top level rule package). All available data is also called the "data context" of each rule.

Related Concepts.

- Section 3.5, “Flow Rule Element” [31]
- Section 3.3, “Rule Package” [26]
- Section 3.4.1, “Flow Rule Template” [30]
- Section 3.3.1, “Rule Package Reuse” [28]

Related Tasks.

- Section 4.2.8, “Creating a new Flow Rule” [97]

3.4.1. Flow Rule Template

Flow rule templates are blueprints for newly created flow rules. Flow rules that are newly added to your rule model are usually empty. They do neither have any data definitions, nor any rule elements - except for the start element.

New rules have to be defined from scratch, unless you are using rule templates. Templates can contain any number of predefined rule elements, including input/output data, actions etc. Templates are especially useful when you create a lot of similar rules, e.g. data validation rules that all should follow a specific pattern.

A flow rule template is very similar to any regular flow rule. They are defined within rule packages and have a name that identifies them. You can use the same graphical editors to edit a flow rule or a flow rule template.

When a new flow rule is created, the **New Flow Rule** wizard allows you to select a template for it. The template with all its contents (including data, actions, types, rule elements) is then copied into the newly created flow rule.

Related Tasks.

- Section 4.2.8, “Creating a new Flow Rule” [97]

3.5. Flow Rule Element

Every flow rule is composed of individual rule elements connected to each other. This is the list of all available rule elements:

Start

The Start element denotes the beginning of each flow rule. Rule execution always starts from the start element and continues to the right and down, just like you are reading a book.

Decision

Decision elements are used to represent any kind of decision the rule has to make. Decisions have two or more exits that may be followed by additional rule elements. Depending on the result of the decision, the rule elements following the respective exit are executed or not executed.

Assignment

Assignment elements are used to define any kind of calculation the rule has to make. There are numerous operations and functions available for calculation. The assignment element stores the results for later use in other calculations as well as in decisions or actions.

Fire Action

The Fire Action element triggers a specific action. In the simplest case this merely sets the value of the fired action to `true`. This status can then later be evaluated by any caller of the rule. Depending on the type of action fired, specific things can happen. E.g. the action may send an email or trigger another process or produce domain specific results. Visual Rules can be extended by adding any number of custom action types.

Call Flow Rule

The Call Flow Rule element triggers the execution of some other flow rule. Once the other rule is finished, execution continues again in the original rule. Data can be forwarded to the rule being called and the results can be evaluated by the calling rule. This concept allows to organize rules into fine granular pieces that can be easily reused anywhere necessary.

Call Decision Table

The Call Decision Table element triggers the execution of a decision table. Once the decision table is finished, execution continues again in the original rule. Data can be forwarded to the decision table being called and the results can be evaluated by the calling rule.

Call Service

The Call Service element is used to call a service external to Visual Rules. This enables rules to reuse functionality available elsewhere, e.g. in legacy systems or anywhere else. Visual Rules can be extended by adding custom services and service types.

Done & Return

The Done & Return element stops any further execution of the rule. This is often used when the rule has decided that any further processing is unnecessary, e.g. if some required preconditions are not met. Execution then immediately continues where the rule was originally called.

Repeat

The Repeat element is used to execute parts of the rule multiple times. This is often useful if the rule must process multiple data items, e.g. "all the items of an order".

End Repeat

The End Repeat element is used in cases when the rule has decided that it can end an ongoing Repeat prematurely, e.g. when the Repeat was used to search data and the matching data was found so the rest of the data doesn't have to be looked at.

Return Exception

The Return Exception element can be used whenever the rule has detected an 'exceptional' situation where it cannot execute any further, e.g. if necessary data is missing or validations have failed. In this case a message describing the exception is generated with the Return Exception element and execution continues where exceptions are handled.

Handle Exception

The Handle Exception element is used to react to 'exceptional' situations. It defines the alternative rule elements that are executed when 'normal' rule execution triggered a Return Exception element or if some technical error has occured.

The color of each rule element does have a specific meaning and helps you to understand the rule logic:

- The color yellow is used for rule elements in which decisions are made.
- The color blue is used for rule elements that do computations or fire actions, i.e. they change data.
- The color green is used for rule elements that influence the order of rule execution. For example repeats and call rule elements are green.
- The color red is used for rule elements that have to do with exceptions or errors.

Every rule element has a box next to it that displays a description and/or the contents of the element. There are two icons (and) on the toolbar that let you toggle the display of the descriptions and contents respectively.

Descriptions for every rule element are very important for the collaboration between the business experts and the rule author (who may not necessarily be the same person). It should always be pos-

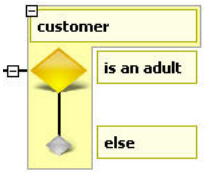
sible to understand a rule by looking at the descriptions only and not at the actual contents (rule expressions). Rules are often drafted using descriptions only and later on, in a second step, the rule is refined by writing the corresponding rule expressions.

Related Concepts.

- Section 3.4, “Flow Rule” [29]
- Section 3.12, “Expressions” [55]

3.5.1. Decision

Decisions are the most important concept of many rules. They are used whenever a rule needs to make a distinction between two or more different situations, e.g. for a specific rule about customers it may be relevant to check whether the customer is an adult or not. This is what such a decision looks like in Visual Rules (only descriptions are shown).



A decision element is displayed as a vertical yellow box with a description on top. This box has one or more exits displayed as yellow diamonds within the box, each with its own description. Every such diamond defines one condition. If that condition is true the rule elements attached to that exit are executed. If none of the conditions are true then the "else" exit is executed. The "else" exit is a small grey diamond and is always the last exit of every decision.

Related Tasks.

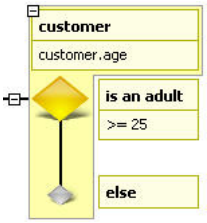
- Section 4.3.10, “Editing a Decision Element” [110]

Related References.

- Section 5.6.2.1, “Decision Overview Tab” [230]
- Section 5.6.2.2, “Decision Details Tab” [231]

3.5.1.1. Simple decision

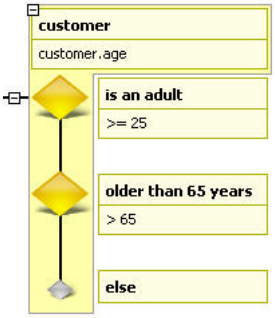
The smallest possible decision only has one condition. The following picture shows such a decision. Both the descriptions (bold font) and the contents of the decision (normal font) are displayed.



The meaning of the decision element shown above is as follows: "If the customer is an adult, then continue with the first exit, otherwise continue with the else exit."

3.5.1.2. Multiple condition decisions

Decisions can have more than one condition. If you add another condition to the example above, you get a multiple condition decision:

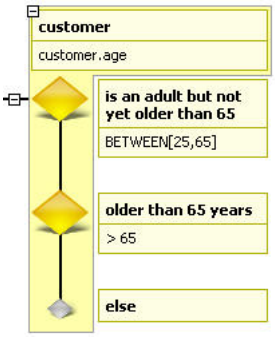


This decision has two conditions and an else exit. It has the following meaning:

"If the customer is an adult, then continue with the first exit, or else, if the customer is older than 65, then continue with the second exit, otherwise continue with the else exit."

The decision has a problem in this form, because if a customer is older than 65 years he or she is also an adult. Consequently the first "is an adult" condition is already true and executed. The second exit would never be executed.

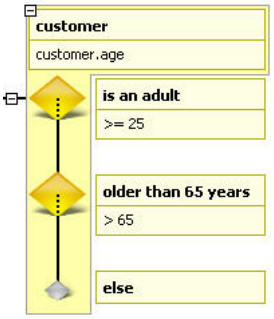
This problem can be solved by a simple modification of the first condition, e.g. by extending the criteria:



This results in a new meaning for the decision, which can be stated as:

"If the customer is an adult, but not yet older than 65, then continue with the first exit, or else, if the customer is older than 65, then continue with the second exit, otherwise continue to the else exit."

Starting from the previous example, it is conceivable that *both* exits "is an adult" and "is older than 65" should be executed. For this there is a decision setting that tells Visual Rules that it should not only execute the *first* exit whose condition is true, but *all* exits whose conditions are true. This behavior is indicated by dashed lines that are displayed when you activate the **Allow multiple matches (not just the first one)** checkbox in the decision properties.



This results in a different logic, formulated in full as:

"If the customer is an adult, then execute the first exit (and continue with the next condition). If the customer is older than 65, then execute the second exit. If neither the first nor the second exit were executed then execute the else exit."

Note that the semantics for the else exit are not affected by the **Allow multiple matches** setting. The else exit is always only executed if *none* of the conditions were true.

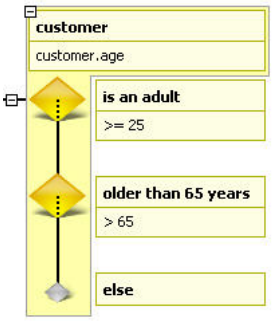
Related Tasks.

- Section 4.3.10, “Editing a Decision Element” [110]

3.5.1.3. Common Condition Prefix

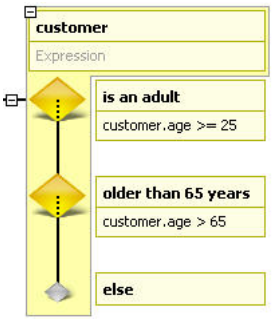
The common condition prefix is placed in front of each condition and is helpful if all conditions refer to the same data element. The prefix is optional and can be left empty.

The following example shows a logical use for the condition prefix:



Each condition refers to the same `customer.age` data element, so this was specified in the prefix, while the conditions themselves just read `>=25` and `>65`.

Without the condition prefix, the decision looks as follows:



Here each condition is fully specified and refers to the `customer.age` data element itself.

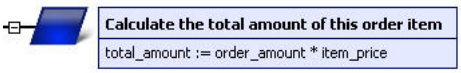
Related Tasks.

- Section 4.3.10, “Editing a Decision Element” [110]

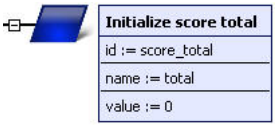
3.5.2. Assignments

The assignment element is used for any type of computation the rule has to make. Basically every assignment calculates some value using a given formula and assigns the result of this calculation to a data element. This is an example for an assignment: `total_amount := order_amount * item_price`

The data element that receives the resulting value is referred to as the "left side" of the assignment, while the formula is called the "right side". For the assignment `total_amount := order_amount * item_price` the left side is `total_amount` and the right side is `order_amount * item_price`. This is what this assignment looks like in VisualRules.



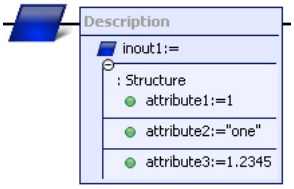
Sometimes you have multiple assignments that belong together. It is possible to group multiple assignments into one element like in this example, which contains three assignments.



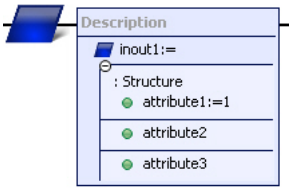
You can also have several assignment one after another. These might concern the same data element in each case.

If so, one assignment is executed after another, such that in the above example the eventual value of the data element **value** would be 3.

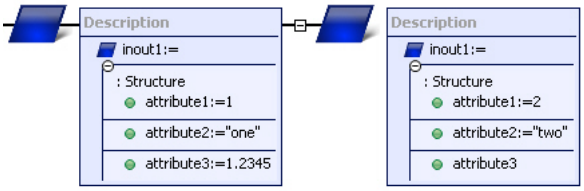
When an assignment concerns a structured data element (i.e. a data element including multiple attributes), then individual values can be assigned to each of these attributes.



Here it is possible not to assign a value to individual attributes, provided that at least to one attribute a value is assigned.



If so, then to those attributes, to which no values are explicitely assigned, type-specific default values will automatically be assigned instead. E.g. in the example below, the eventual value of the attribute 3 will be 0 instead of 1.2345.



Related Concepts.

- Section 3.12, “Expressions” [55]

Related Tasks.

- Section 4.3.11, “Editing an Assignment Element” [112]

Related References.

- Section 5.6.2.3, “Assignments Tab” [232]

3.5.2.1. ADD, REMOVE and CLEAR Assignments

The assignment element offers special operations for working with data elements that contain multiple values, so called "collections". These operations are ADD, REMOVE and CLEAR which allow you to add values to a collec-

tion, to remove values from a collection or to empty a collection. These special operations are indicated by the words `ADD`, `REMOVE` or `CLEAR` instead of the `:=` operation.

With an ADD assignment you can either add a single element or another collection. In the latter case, all elements of the collection are added. The same is true for a REMOVE assignment. Here you can remove a single element or all elements in another collection.

This is an example of an ADD assignment which adds a customer to a list of preferred customers. In order for this to work, the `preferredCustomers` element must be a collection, list or set, i.e. it must have the **multiple** setting activated.

Example 3.1. ADD and CLEAR assignments

The CLEAR operation does not have a right side, so it simply reads:

Collections can be defined to contain "unique" elements only, i.e. every element can appear only once within that collection. Here are the exact semantics for the ADD and REMOVE operations depending on the **unique** setting of the collection used on the left side.

Table 3.2. ADD and REMOVE assignment semantics

"Unique" setting of the collection	**ADD element**	**REMOVE element**
unique = false	The element is added to the end of the collection. This happens even if the element already appeared somewhere within the collection.	The element is removed from the collection. If the element appears multiple times within the collection, only the first occurance of it will be removed. If the element does not appear within the collection, nothing happens.
unique = true	The element is added to the end of the collection unless the collection already contains the element. If the collection already contained the element, nothing happens.	The element is removed from the collection. If the collection does not contain the element, nothing happens. Because every element can only appear once within a "unique" collection, the element is guaranteed to not be contained in the collection afterwards.

For data and data types defined outside of Visual Rules the behavior of the ADD assignment may be different. Especially it is possible that the element is not added to the end of the collection but somewhere else. The exact behavior is defined by the implementation of the collection within your business object model.

Related Concepts.

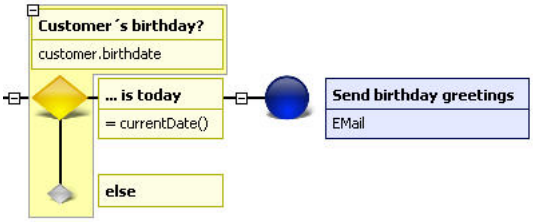
- Section 3.14.7, “Collection” [76]

3.5.3. Fire Action

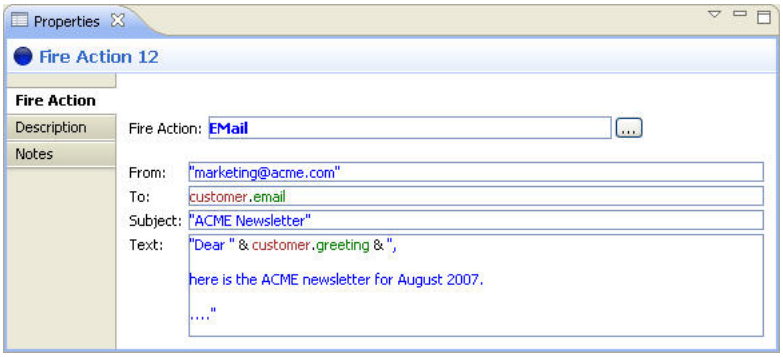
Actions are used to define the "consequences" of a rule. The Fire Action element is used to trigger a specific action. The value of the fired action is set to `true`. This status can then later be evaluated by any caller of the rule.

Additionally, depending on the type of action fired, specific things can happen. E.g. the action may send an email or trigger another process or produce other domain specific results. Visual Rules can be extended by adding any number of custom action types.

The Fire Action element specifies which action it wants to fire. It can fire any action that is defined for the rule itself or for the packages containing the rule. The name of the action is displayed next to the Fire Action element, e.g. this fires the action named "EMail" (if today is the customer's birthday):



An action may require additional information to perform its task. For example, sending an email requires the email addresses of the sender and the recipient, a subject line and the text for the email body. The exact data that is needed for an action is determined by the type of action fired. When you double-click a Fire Action element in the rule editor, you can view and modify that data on the **Fire Action** tab in the **Properties**.



Related Concepts.

- Section 3.16, “Action” [79]

Related Tasks.

- Section 4.3.12, “Editing a Fire Action Element” [114]
- Section 4.8, “Working with Actions” [154]

Related References.

- Section 5.6.2.4, “Fire Action Tab” [234]

3.5.4. Call Flow Rule

Call Flow Rule elements are used whenever a flow rule wants to reuse other flow rules. The called rule is executed and afterwards processing continues after the Call Flow Rule element. Rules are only allowed to call rules from the same package, from any subpackage and from any package that is defined to be reused. So in order to reuse a specific rule you may first have to setup the reused packages properly. See Section 3.3.1, “Rule Package Reuse” [28] for details.

The Call Flow Rule element specifies the name of the rule being reused. This name is displayed next to the element, like this:

The values for any required input of the called rule are also specified within the Call Flow Rule element. This way rules can forward data from one rule to another. In the same way, any results coming out of the called rule can be assigned to data elements of the calling rule. This is also specified within the Call Flow Rule element. In other words, the Call Flow Rule element calls another rule and handles all the data flowing to and from the called rule.

Input and output data is specified on the **Call Flow Rule** tab in the **Properties** view.

Related Concepts.

- Section 3.4, “Flow Rule” [29]
- Section 3.3.1, “Rule Package Reuse” [28]

Related Tasks.

- Section 4.3.15, “Editing a Call Flow Rule Element” [115]

Related References.

- Section 5.6.2.5, “Call Flow Rule” [234]

3.5.5. Call Decision Table

A Call Decision Table element is used to execute the decisions of a decision table. The decision table is executed and afterwards processing continues after the Call Decision Table element. A flow rule may only call decision tables that are located in the same rule package, or in any subpackage or in rule packages that are defined to be reused. See Section 3.3.1, “Rule Package Reuse” [28] for details about reusing packages.

The Call Decision Table elements specifies the name of the decision table being called. This name is displayed next to the element, like this:

The values for any required input of the called decision table are also specified within the Call Decision Table element. This way rules can forward data to the decision table. In the same way, any results coming out of the decision table can be assigned to data elements of the calling rule. This is also specified within the Call Decision Table element. In other words, the Call Decision Table element calls a decision table and handles all the data flowing to and from the decision table.

Input and output data is specified on the **Call Decision Table Rule** tab in the **Properties** view.

Related Concepts.

- Section 3.7, “Decision Table” [48]
- Section 3.3.1, “Rule Package Reuse” [28]

Related Tasks.

- Section 4.4, “Working with Decision Tables” [125]

Related References.

- Section 5.6.2.6, “Call Decision Table” [235]

3.5.6. Call Service

Call Service elements are used whenever a rule wants to call a service. The service is called and afterwards processing continues after the Call Service element. Services are external to Visual Rules, so this element allows Visual Rules to reuse functionality available elsewhere.

The Call Service element specifies the name of the service to be called. This name is displayed next to the element, like this:

The values for any required input of the service are also specified within the Call Service element. This way rules can forward data to the service. In the same way, any results coming out of the service can be assigned to data elements of the calling rule. This is also specified within the Call Service element. In other words, the Call Service element calls an external service and handles all the data flowing to and from that service.

Input data is specified on the **Call Service - Input** tab in the **Properties**. Accordingly, the use of any output data is specified on the **Call Service - Output** tab.

Related Concepts.

- Section 3.19, “Service” [81]
- Section 3.20, “Service Type” [82]

Related Tasks.

- Section 4.3.17, “Editing a Call Service Element” [117]

Related References.

- Section 5.6.2.7, “Call Service” [236]

3.5.7. Done & Return

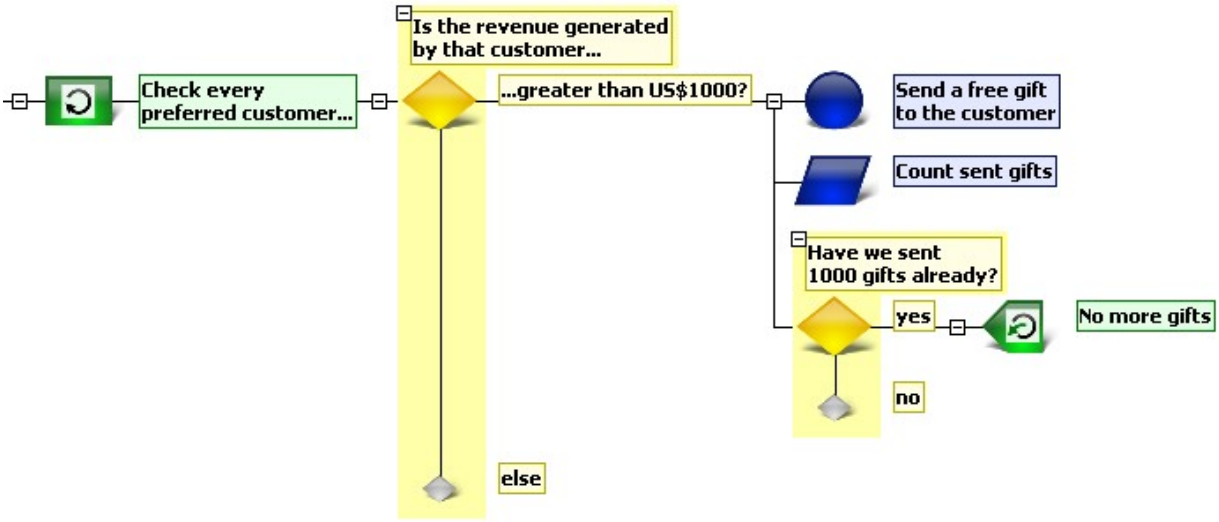
The Done & Return element stops any further execution of the rule. This is often useful when the rule has decided that any further processing is unnecessary, e.g. if some required preconditions are not met. Execution then immediately continues where the rule was originally called.

Related Concepts.

- Section 3.4, “Flow Rule” [29]

3.5.8. Repeat

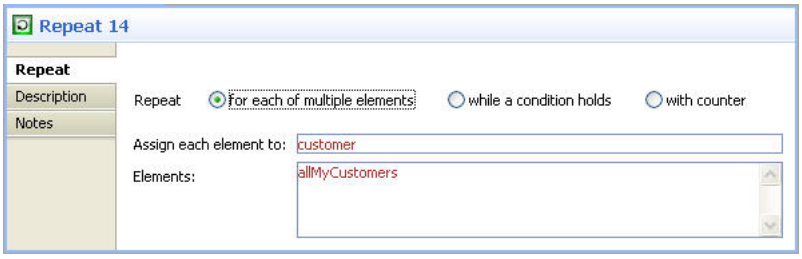
The Repeat element is used to execute a part of the rule multiple times. This is often useful if the rule must process multiple data items, e.g. "all the items of an order". The rule elements that should be executed multiple times must be attached to the Repeat element which determines how often it will execute these.



There are three different types of Repeat:

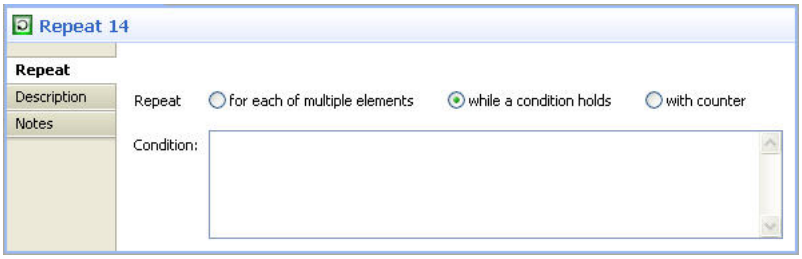
Repeat for each of multiple elements

This is used to repeat execution for each one of multiple data elements specified in the **Elements** field. Every time it executes, the next data element is assigned to the data element specified in the **Assign each element to** field. If the number of data elements is zero, the Repeat is not executed at all.



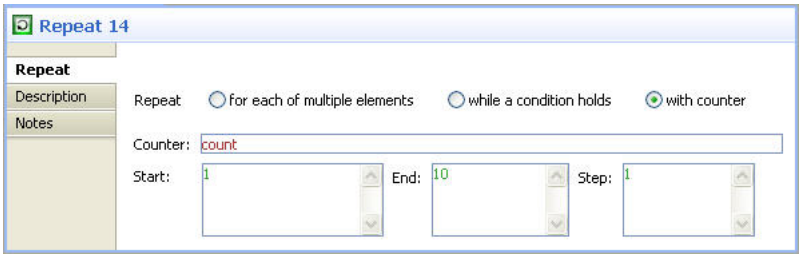
Repeat while a condition holds

Execution repeats as long as the specified condition is true and ends when the condition is false. If the condition is false right from the beginning, the Repeat is not executed at all. The condition should be formulated with care in order to prevent situations where the condition is *always* true. In that case the rule would remain in an endless loop.



Repeat with counter

This kind of Repeat uses a counter that starts with a given start value (**Start**) and is incremented each time by a given step value (**Step**) until it reaches (or passes) the given end value (**End**). The current value of the counter is stored in the data element specified in the **Counter** field.



Related Tasks.

- Section 4.3.13, “Editing a Repeat Element” [115]

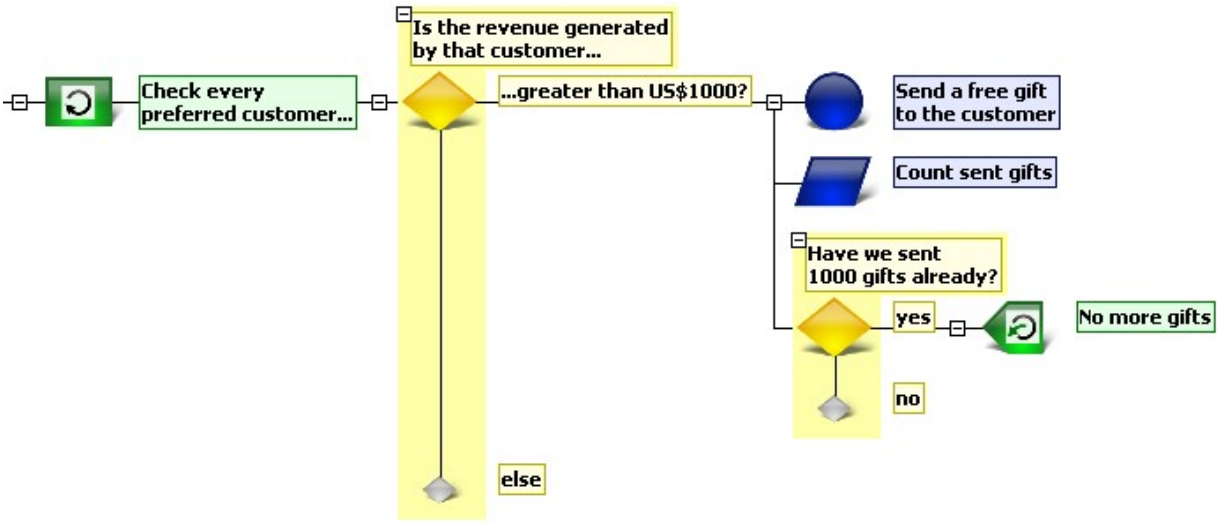
Related Reference.

- Section 5.6.2.8, “Repeat Tab” [237]

3.5.9. End Repeat

The End Repeat element is used in cases when the rule has decided that it can end an ongoing Repeat prematurely, e.g. when the Repeat was used to search data and the matching data was found so the rest of the data doesn't have to be looked at. The End Repeat element must be placed somewhere within the branch attached to the Repeat element. It will always end the nearest Repeat element. This is important to keep in mind when you have multiple Repeat elements following each other.

This example illustrates how a Repeat End element is used to end a Repeat once a thousand gifts have been sent to customers.



Related Concepts.

- Section 3.5.8, “Repeat” [40]

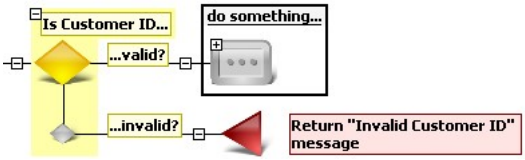
Related Tasks.

- Section 4.3.14, “Editing an End Repeat Element” [115]

3.5.10. Return Exception

The Return Exception element can be used whenever the rule has detected an 'exceptional' situation where it cannot execute any further, e.g. if necessary data is missing or validations have failed. In this case a message describing the exception is generated with the Return Exception element. Afterwards execution immediately continues at the "most recent" Handle Exception element at which rule execution came by before.

The "most recent" Handle Exception element is determined by going backwards from the Return Exception element towards the Start element of the rule and if no Handle Exception element was found this way, search continues in the calling rule backwards from the corresponding Call Flow Rule element. This goes on until the Start element of the initial rule is reached. If no Handle Exception element was found even then, rule execution terminates and the exception is returned to whoever was calling the rule initially.



Related Concepts.

- Section 3.14.6, “Exception” [76]

Related Tasks.

- Section 4.3.18, “Editing a Return Exception Element” [118]

Related Reference.

- Section 5.6.2.9, “Return Exception Tab” [239]

3.5.11. Handle Exception

The Handle Exception element is used to react to 'exceptional' situations. It defines the alternative rule elements that are executed when 'normal' rule execution within a rule branch triggered a Return Exception element or if some technical error has occured.

The Handle Exception rule element is displayed differently to all the other elements. It is not attached to the right of another element but it is shown at the bottom of a box that is drawn around a rule branch. A Handle Exception rule element is executed if an exception occurs somewhere in this branch or in other rules being called from within that branch. The Handle Exception element and all elements attached to it are shown on a red background to make it easier to distinguish the 'normal' flow from the 'exceptional' flow.

This is an example for the use of the Handle Exception element. A customer rating is calculated by reusing an appropriate rule. If anything goes wrong there (e.g. an exception because of missing data or because of a division by zero) the customer rating is set to a default of 1.

Every exception is handled by only one Handle Exception element (the "most recent" one). Once an exception is handled, execution continues normally after the branch with the Handle Exception element.

The Handle Exception element **can** specify a data element to hold the exception that occurred. This way the Handle Exception branch can inspect the exception and its attributes. This is especially useful if you want to do different things depending e.g. on the exception type. If this field remains empty, all exceptions are catched, but a further estimation/evaluation is not possible.

If a data element is specified, only those exceptions are handled that match the type of that data element, i.e. they must be of the same type or any subtype. Exceptions of other types will remain unhandled by this Handle Exception element.

It is possible to have a Return Exception element as part of the exception handling (on the red background). This again will generate an exception message that can be handled by another Handle Exception element.

Related Concepts.

- Section 3.14.6, “Exception” [76]

Related Tasks.

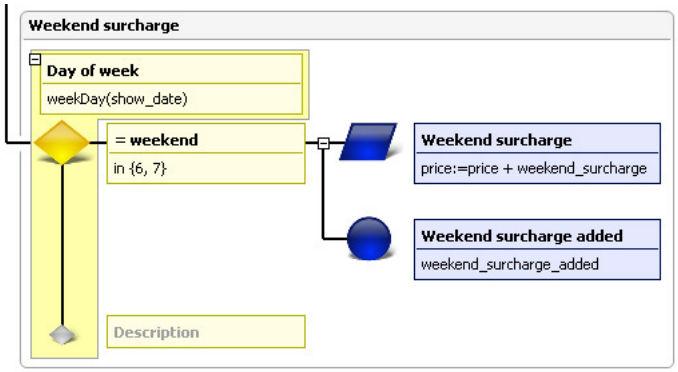
- Section 4.3.19, “Editing a Handle Exception Element” [119]

Related Reference.

- Section 5.6.2.10, “Handle Exception Tab” [240]

3.5.12. Branch Description

Branch descriptions are used to describe a whole rule branch instead of just individual elements. This is often useful to structure and describe a rule on a larger scale. When a branch description is added to a rule element, a box is drawn around the branch rooted at that element. The branch description itself is then written across the top of that box.



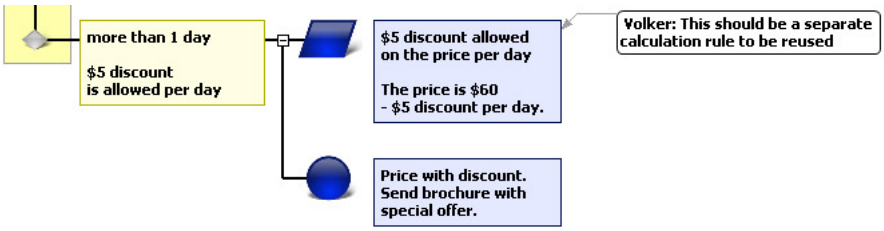
It's very useful that when a branch is collapsed, the branch description remains visible.

Related Tasks.

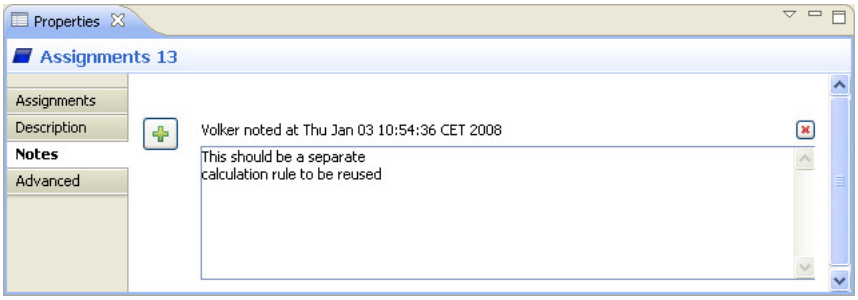
- Section 4.3.25, “Adding a Branch Description” [121]
- Section 4.3.26, “Deleting a Branch Description” [121]

3.5.13. Notes

Rule elements can have notes attached to them. All notes are displayed to the right of the rule and a line connects them to the rule element.



Notes are meant to be used to leave editorial remarks for yourself or for others involved in the rule authoring process. For that purpose every note shows the name of the user who created it. On the **Notes** properties tab you can also see timestamps for every note indicating when it was created.



Related Concepts.

- Section 3.15, “Description and Note” [78]

Related Tasks.

- Section 4.3.27, “Adding a Note” [121]
- Section 4.3.28, “Deleting a Note” [121]

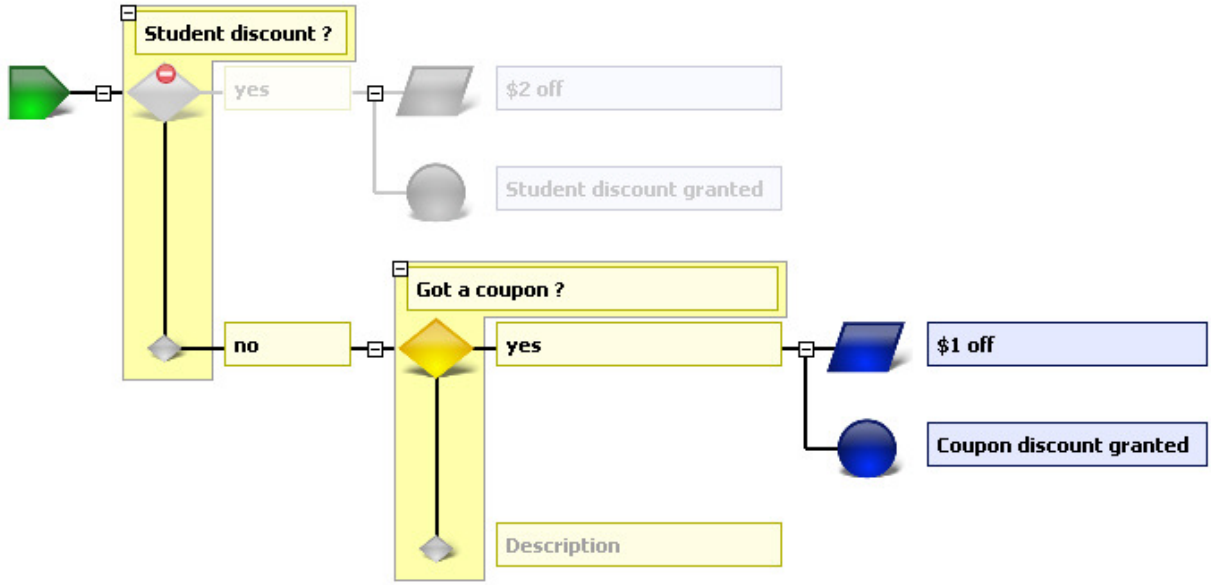
Related References.

- Section 5.6.1.2, “Notes Tab” [230]

3.5.14. Rule Element Deactivation

Individual rule elements can be deactivated, which means that they themselves and all elements attached to them will not be executed. Deactivated rule elements are greyed out and a red icon is displayed (⛔).

Deactivation has the same effect as deleting the element and all its successors. However, it is often convenient during rule authoring and testing to not delete elements but to only temporarily deactivate them.



Related Tasks.

- Section 4.3.29, “Activating/Deactivating a Rule Element” [122]

3.6. Flow Rule Editor

The flow rule editor is used to view and edit a rule. Most of the flow rule authoring process takes place here. The editor is opened whenever you double-click on a flow rule, e.g. in the **Rule Explorer**. Multiple rule editors can be open at the same time.

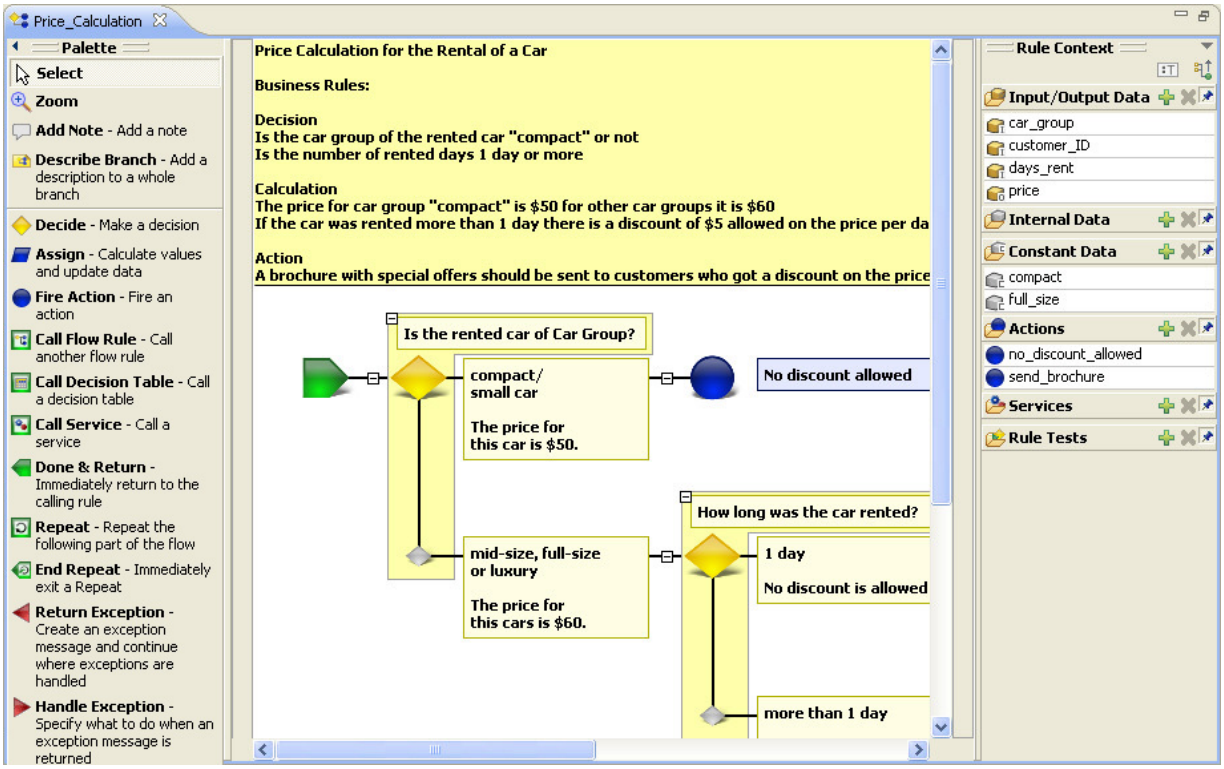

Price_Calculation
Palette
Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Fire Action - Fire an action
Call Flow Rule - Call another flow rule
Call Decision Table - Call a decision table
Call Service - Call a service
Done & Return - Immediately return to the calling rule
Repeat - Repeat the following part of the flow
End Repeat - Immediately exit a Repeat
Return Exception - Create an exception message and continue where exceptions are handled
Handle Exception - Specify what to do when an exception message is returned
Price Calculation for the Rental of a Car
Business Rules:
Decision
Is the car group of the rented car "compact" or not
Is the number of rented days 1 day or more
Calculation
The price for car group "compact" is $50 for other car groups it is $60
If the car was rented more than 1 day there is a discount of $5 allowed on the price per da
Action
A brochure with special offers should be sent to customers who got a discount on the price
Is the rented car of Car Group?
compact/ small car
The price for this car is $50.
No discount allowed
mid-size, full-size or luxury
The price for this cars is $60.
How long was the car rented?
1 day
No discount is allowed
more than 1 day
Rule Context
Input/Output Data
car_group
customer_ID
days_rent
price
Internal Data
Constant Data
compact
full_size
Actions
no_discount_allowed
send_brochure
Services
Rule Tests

Figure 3.2. Rule Editor

The flow rule editor is a sophisticated graphical editor with a tool palette, drag&drop capabilities, zoom and inplace editing functionality. "Inplace editing" means that many things can be edited right within the graphical display, e.g. all the descriptions and/or rule expressions shown next to each flow rule element can be edited simply by double-clicking on them. Some other settings for each flow rule element can be edited in the **Properties** view. The **Properties** view always shows the settings for the currently selected rule element.

When changes have been made to a flow rule, the flow rule editor will indicate this by displaying an asterisk (*) in front of the flow rule name shown in the editor's tab. Clicking the button or pressing **Ctrl**+**S** will save these changes.

Related Tasks.

- Section 4.3, “Working with Flow Rules” [103]

Related References.

- Section 5.3.1, “Flow Rule Editor” [205]

3.6.1. Rule Editor Palette

The rule editor has a palette from which the user can select new rule elements to be inserted into the rule. The palette also contains tools for zooming, adding notes and adding branch descriptions.

The palette can be collapsed and expanded by clicking on the small black arrow in the title bar of the palette.

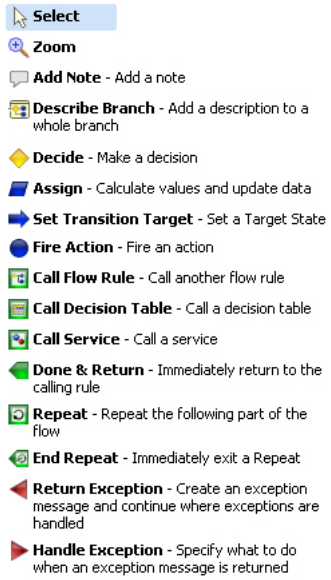

Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Set Transition Target - Set a Target State
Fire Action - Fire an action
Call Flow Rule - Call another flow rule
Call Decision Table - Call a decision table
Call Service - Call a service
Done & Return - Immediately return to the calling rule
Repeat - Repeat the following part of the flow
End Repeat - Immediately exit a Repeat
Return Exception - Create an exception message and continue where exceptions are handled
Handle Exception - Specify what to do when an exception message is returned

Figure 3.3. Rule Editor palette

Related Tasks.

- Section 4.3, “Working with Flow Rules” [103]

Related References.

- Section 5.3.1.1, “Flow Rule Editor Palette” [205]

3.6.2. Rule Context Palette

The rule editor has a **Rule Context** palette which displays the data elements, actions and services the rule can access. It also lists the rule tests available for the rule. The palette gives quick access to all these items, so that the rule author does not have to continuously switch to the **Project Explorer**. This is especially useful when the rule editor is maximized.

Depending on the state of the toolbar button, the list only shows the elements defined and owned by the rule itself, or all elements in the rule package hierarchy or being reused.

All elements can be edited by double-clicking them. A single click on a selected item allows it to be renamed. Elements can be created and deleted using the corresponding and buttons.

The palette can be collapsed and expanded by clicking on the small black arrow in the title bar of the palette.

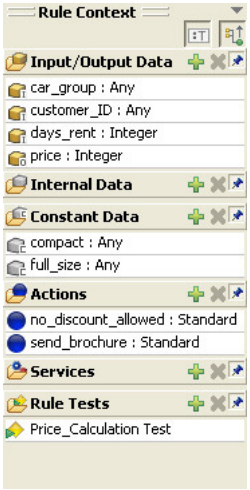


Figure 3.4. Rule Context palette

Related Tasks.

- Section 4.3, “Working with Flow Rules” [103]

Related References.

- Section 5.3.1.2, “Rule Context Palette” [206]

3.7. Decision Table

A decision table is a rule representation especially suited for rules with many decisions based on only a few inputs.

The following image shows a Visual Rules decision table that determines the number of bonus points a customer receives, depending on the kind of bonus card he or she holds (either gold or silver) and the money spent for the purchase.

According to the decision table, a "gold" card holder which has spent more than $8 will receive 50 points. A "silver" card holder who has spent less than $8 will receive only 15 points.

What Bonus Card does the customer have? bonus_card	**How much did the customer pay?** money_spent	bonus_points
= BONUS_CARD.GOLD	< 6	20
	< 8	35
	>= 8	50
= BONUS_CARD.SILVER	< 8	15
	>= 8	20

Figure 3.5. Decision table

Conditions (yellow) can be either positioned at the left side of the decision table or at the top. For example, the following picture shows the decision table with an additional condition row for the day of week. On Wednesday, bonus points are doubled. On all other days (expressed by the empty condition) the normal bonus points apply.

Day of week? weekday		= WEDNESDAY	
What Bonus Card does the customer have? bonus_card	**How much did the customer pay?** money_spent	bonus_points	bonus_points
= BONUS_CARD.GOLD	< 6	40	20
	< 8	70	35
	>= 8	100	50
= BONUS_CARD.SILVER	< 8	30	15
	>= 8	40	20

Figure 3.6. Decision table with conditions to the left and at the top

Related Concepts.

- Section 3.4, “Flow Rule” [29]

Related Tasks.

- Section 4.4, “Working with Decision Tables” [125]

Related References.

- Section 5.3.2, “Decision Table Editor” [207]

3.7.1. Condition Column/Row

Condition columns or rows (yellow) define the conditions that are being checked by the decision table. Conditions are always located at the left side or at the top of the decision table. Conditions at the left side are oriented in a column (vertically), while conditions at the top are oriented in rows (horizontally).

There can be any number of condition columns/rows next to each other. Each condition column/row consists of the condition header and several conditions, one of which can be a special "else" condition.

Condition columns/rows are added to an existing decision table with the **Decide** tool in the palette or by dragging an input data element from the **Rule Context** palette.

Related Concepts.

- Section 3.7, “Decision Table” [48]

Related Tasks.

- Section 4.4.2, “Adding a new Decision Column or Row” [125]

Related References.

- Section 5.3.2.1, “Decision Table Editor Palette” [207]

3.7.2. Assignment Column

An assignment column in a decision table is used to specify values in its cells that are being assigned to the data element in the column header. In other words, the assignment column contains the values that are the output (or one of several outputs) of the decision table. The selected cell is determined by the conditions specified in condition columns/rows.

Assignment columns are added to an existing decision table with the **Assign** tool in the palette or by dragging an output data element from the **Rule Context** palette.

Related Concepts.

- Section 3.7, “Decision Table” [48]

Related Tasks.

- Section 4.4.6, “Adding a new Assignment Column” [128]

Related References.

- Section 5.3.2.1, “Decision Table Editor Palette” [207]

3.7.3. Action Column

An action column in a decision table is used to fire actions if specific conditions are true. The action column itself specifies the action to be fired in its column header. The cells of the column either contain a cross (x) or a dash (-), depending on whether the action should be fired or not under the conditions leading to that cell.

Action columns are added to an existing decision table with the **Fire Action** tool in the palette or by dragging an action from the **Rule Context** palette.

Related Concepts.

- Section 3.7, “Decision Table” [48]

Related Tasks.

- Section 4.4.12, “Adding a new Action Column” [131]

Related References.

- Section 5.3.2.1, “Decision Table Editor Palette” [207]

3.7.4. Exception Column

An exception column in a decision table is used to signal exceptions if specific conditions are true. The exception column itself specifies the exception to be returned in its column header. The cells of the column either contain a cross (x) or a dash (-), depending on whether the exception should be returned or not under the conditions leading to that cell.

Exception columns are added to an existing decision table with the **Return Exception** tool in the palette.

Related Concepts.

- Section 3.7, “Decision Table” [48]

Related Tasks.

- Section 4.4.14, “Adding a new Exception Column” [132]

Related References.

- Section 5.3.2.1, “Decision Table Editor Palette” [207]

3.8. Decision Table Editor

The decision table editor is used to view and edit a decision table. Most of the decision table authoring process takes place here. The editor is opened whenever you double-click on a decision table, e.g. in the **Rule Explorer**. Multiple decision table editors can be open at the same time.

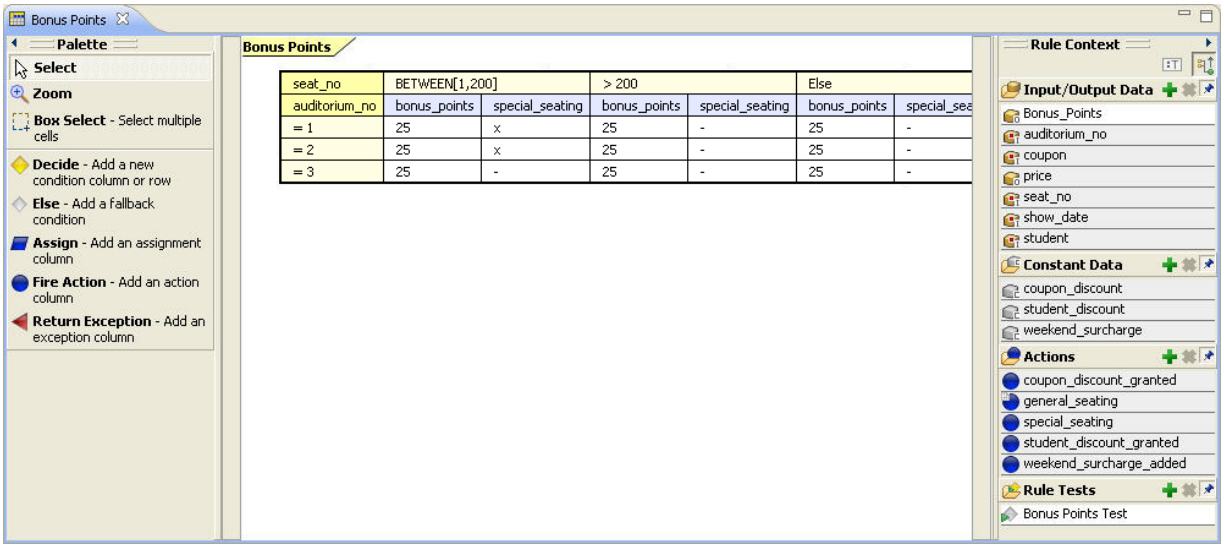


Figure 3.7. Decision Table Editor

The decision table editor is a sophisticated graphical editor with a tool palette, drag&drop capabilities, zoom and inplace editing functionality. "Inplace editing" means that the contents of the decision table can be edited right within the graphical display and can be edited simply by double-clicking on the specific cell. Some other settings for

each decision table element can be edited in the **Properties** view. The **Properties** view always shows the settings for the currently selected cell of the decision table.

When changes have been made to a decision table, the decision table editor will indicate this by displaying an asterisk (*) in front of the decision table name shown in the editor's tab. Clicking the button or pressing **Ctrl**+**S** will save these changes.

The decision table editor highlights the conditions that lead to the currently selected cell. That makes navigating large tables much easier. You can turn this feature on/off in the **View** context menu or with the corresponding **Highlight Condition Path** button in the toolbar.

bonus_card		= BONUS_CARD.GOLD	= BONUS_CARD.SILVER
weekDay(currentDate())	money_spent	bonus_points	bonus_points
= 1	< 6	40	20
	< 8	70	30
	>= 8	100	40
Else	< 6	20	10
	< 8	35	15
	>= 8	50	20

Figure 3.8. Decision table with selected conditions

3.8.1. Decision Table Editor Palette

The decision table editor has a palette from which the user can select new decision table elements to be inserted into the decision table. The palette also contains tools for zooming and selecting mulitple cells of the decision table.

The palette can be collapsed and expanded by clicking on the small black arrow in the title bar of the palette.

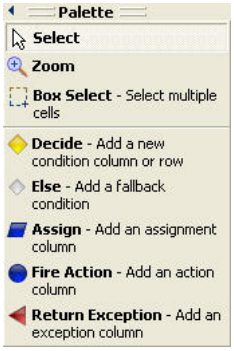

Palette
Select
Zoom
Box Select - Select multiple cells
Decide - Add a new condition column or row
Else - Add a fallback condition
Assign - Add an assignment column
Fire Action - Add an action column
Return Exception - Add an exception column

Figure 3.9. Decision Table Editor palette

3.8.2. Decision Table Context Palette

The decision table editor has a **Rule Context** palette which displays the data elements and actions the decision table can access. It also lists the rule tests available for the decision table. The palette gives quick access to all these items, so that the decision table author does not have to continuously switch to the **Rule Explorer**. This is especially useful when the decision table editor is maximized.

Depending on the state of the toolbar button, the list only shows the elements defined and owned by the decision table itself, or all elements in the rule package hierarchy or being reused.

All elements can be edited by double-clicking them. A single click on a selected item allows it to be renamed. Elements can be created and deleted using the corresponding and buttons.

The palette can be collapsed and expanded by clicking on the small black arrow in the title bar of the palette.

Figure 3.10. Decision Table Context palette

3.9. State Flow

A state flow is a graphical representation of the different states, which a system can adopt during runtime, and it specifies the events, which may cause changeovers between individual states.

Every state flow has a name that identifies it. All state flows in a rule package must have different names, so that each state flow can be uniquely identified by its name and package. State flows can have the same name if they are located in different rule packages.

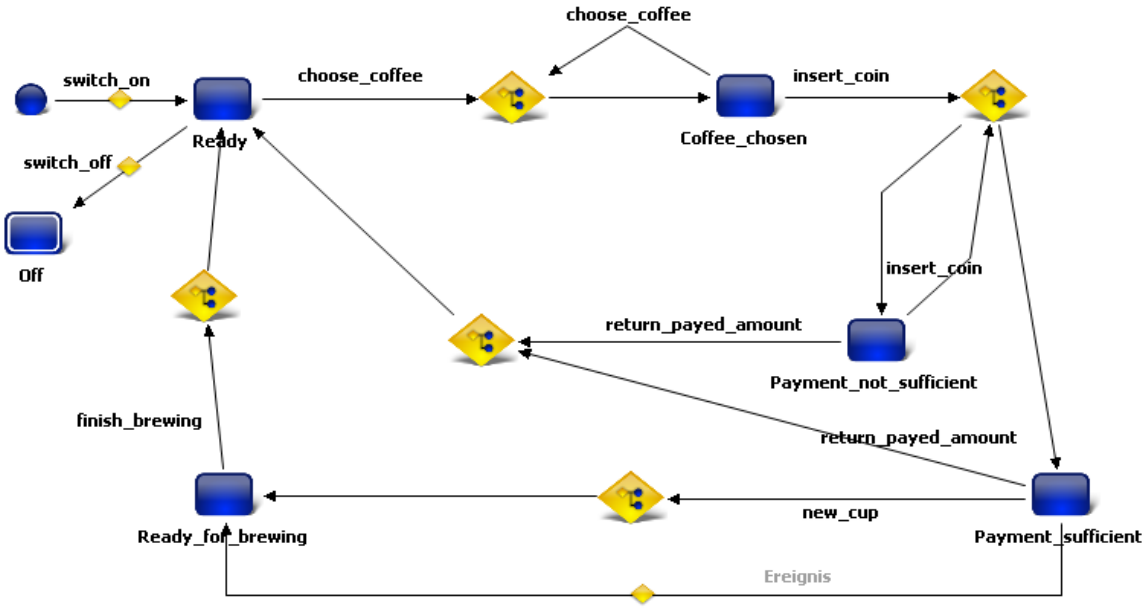


Figure 3.11. Graphical representation of a state flow in Visual Rules

Related Tasks.

- Section 4.2.14, “Creating a new State Flow” [99]

3.10. State Flow Element

3.10.1. State

The state element represents an intermediate state that a system can adopt.

Related Concepts.

- Section 3.9, “State Flow” [52]

3.10.2. End State

The end state element represents a final state that a system can adopt.

There may be several end states within a state flow.

Related Concepts.

- Section 3.9, “State Flow” [52]

3.10.3. Transition

The transition element represents a changeover between states. Within a state flow it is accompanied by a yellow diamond .

A transition can be based on a transition rule. If so, this is indicated by a rule symbol in the yellow diamond.

Related Concepts.

- Section 3.9, “State Flow” [52]

3.10.4. Transition Rule

A transition rule is a flow rule, which a transition in a state flow is based on.

Related Concepts.

- Section 3.9, “State Flow” [52]

3.10.5. Transition Target

A transition target is a flow rule element that represents the exit of a transition rule. Here a state is specified which is adopted next.

Related Concepts.

- Section 3.9, “State Flow” [52]

3.11. State Flow Editor

The state flow editor is used to view and edit a state flow. The editor is opened whenever you double-click on a state flow, e.g. in the **Rule Explorer**. Multiple state flow editors can be open at the same time.

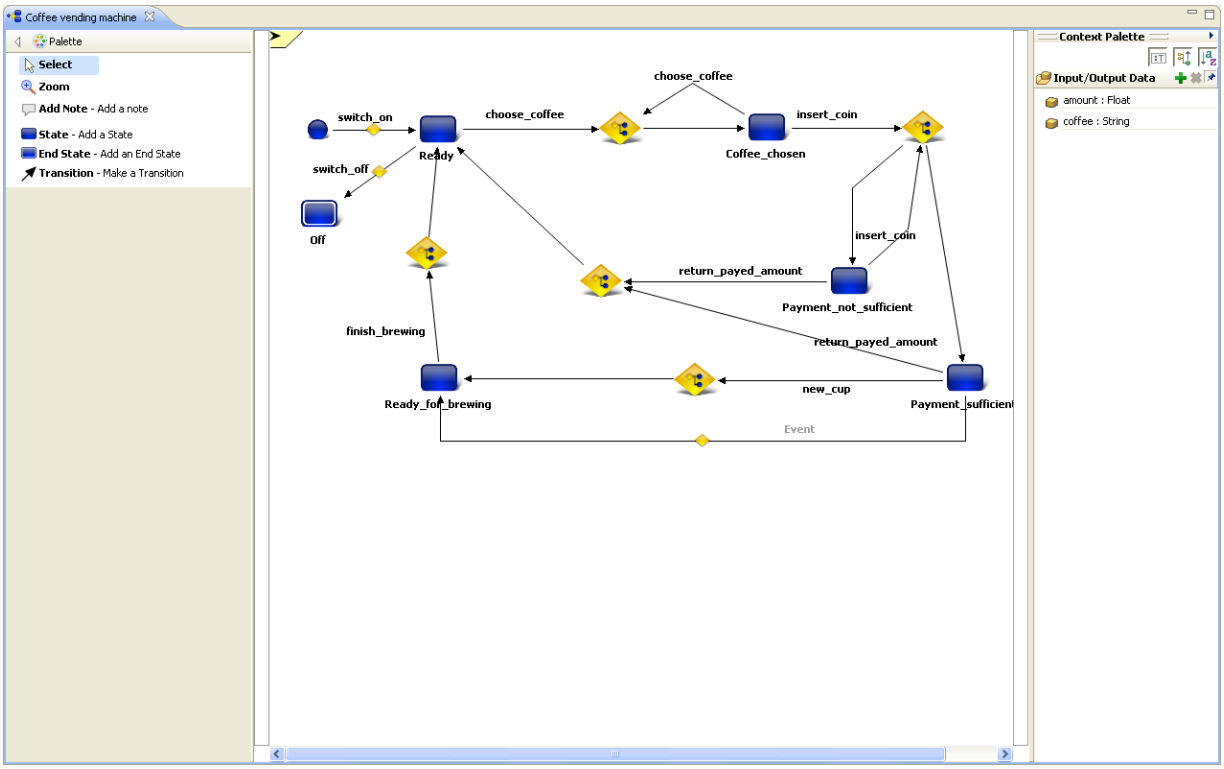


Figure 3.12. State Flow Editor

The state flow editor is a sophisticated graphical editor with a tool palette, drag&drop capabilities, zoom and in-place editing functionality. "Inplace editing" means that many things can be edited right within the graphical display. Some other settings for each state flow element can be edited in the **Properties** view. The **Properties** view always shows the settings for the currently selected state flow element.

When changes have been made to a state flow, the state flow editor will indicate this by displaying an asterisk (*) in front of the state flow name shown in the editor's tab. Clicking the button or pressing **Ctrl**+**S** will save these changes.

3.11.1. State Flow Editor Palette

The state flow editor has a palette from which the user can select new state flow elements to be inserted into the state flow. The palette also contains tools for zooming and adding notes.

The palette can be collapsed and expanded by clicking on the small black arrow in the title bar of the palette.

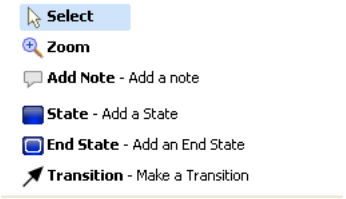


Figure 3.13. State Flow Editor palette

3.11.2. State Flow Context Palette

The state flow editor has a palette which displays the data elements that the state flow can access. The palette gives quick access to all these items, so that the state flow author does not have to continuously switch to the **Project Explorer**. This is especially useful when the state flow editor is maximized.

Depending on the state of the toolbar button, the list only shows the elements defined and owned by the state flow itself, or all elements in the rule package hierarchy or being reused.

All elements can be edited by double-clicking them. A single click on a selected item allows it to be renamed. Elements can be created and deleted using the corresponding and buttons.

The palette can be collapsed and expanded by clicking on the small black arrow in the title bar of the palette.

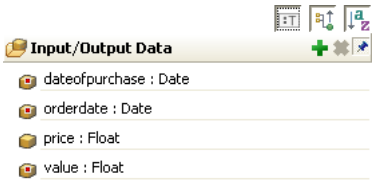


Figure 3.14. State flow Context palette

3.12. Expressions

Expressions are at the core of all rules in Visual Rules. Expressions are used to define the conditions used for decisions and the formulas used for computations and for many other things. Almost every rule element requires one or multiple expressions that define what exactly this rule element should do.

Expressions are the instructions that are evaluated by Visual Rules when processing a rule. Within such an expression you use operators, data elements and functions to access data, carry out arithmetic operations and make decisions.

Example 3.2. Simple expressions

```
17
-1 + 5
(13.5 - 100)*9
```

Be aware that for floating points the decimal separator is always a period, regardless of regional settings.

Use parentheses to influence the order of evaluation. The `(13.5 - 100)*9` example from above first calculates the difference between 13.5 and 100 and then multiplies the result by 9. A different result occurs when the parentheses are left off. 13.5 – 100*9 results in 100 being multiplied by 9 and the result of this being subtracted from 13.5. You can read more about the precedence of operators further down in this section.

Example 3.3. Further notations for numbers

```
8.3% (percent notation)
3e8 (exponential notation)
```

Numbers with a percent sign are automatically divided by `100`, so. `8.3% = 0.083`. Scientific notation is a short form for the multiplication of a number with a power of ten, so 3e8 = 3 times 10 raised to the 8th power = 300000000 and `2e-3 = 0.002`.

You can refer to the values of data elements (input/output, internal, constant) in expressions simply by writing the name of the data element.

Example 3.4. Expressions with data elements

```
purchase_limit > 1000
disposal_limit + 100.0
deposit_value + amountOfShares * ExRateEURO
Share.ExRateEURO * 1.95583 < ThresholdValue
```

When using data elements be aware that their data types have to correspond. Data types can't be combined in just any fashion. For example, a `String` cannot be multiplied by a `Float`, because there is no mathematical rule for doing so. Just like a `Boolean` can't be subtracted from a `Date`.

Example 3.5. Invalid expressions

```
"String" * 5
"A" - true
(10 - 1
```

Any expression you enter is validated by Visual Rules. Any errors are shown in the **Problems** view and the expression will get a marker indicating the problem. For example, the expression

```
"String" * 5
```

produces the following error message in the **Problems** view: Operator "*" is not defined for the types "String, Integer".

Related Concepts.

- Section 3.14, “Data Type” [71]
- Section 3.13, “Data” [67]
- Section 3.12.1, “Arithmetic Operators” [56]
- Section 3.12.4, “Comparison Operators” [57]
- Section 3.12.5, “Logical Operators `AND`, `OR`, `NOT`” [57]
- Section 3.12.7, “Calling Functions” [58]
- Section 3.12.20, “Operator Precedence” [66]

Related Tasks.

- Section 4.10, “Working with Expressions” [157]
- Section 4.10.1, “Using the Code Assist” [157]

3.12.1. Arithmetic Operators

The simple arithmetic operators are `+`, `-`, `*`, `/`. They carry out addition, subtraction, multiplication or division of both operands.

```
11 + 2 = 13
64 - 14 = 40
3 * 6 = 18
11 / 2 = 5.5
```

The `div` operator divides both operands and delivers a whole number result.

```
11 DIV 2 = 5
11 DIV 3 = 3
```

The modulo operator divides both operands and delivers a whole number remainder.

```
11 MOD 2 = 1
11 MOD 3 = 2
```

3.12.2. String Concatenation Operator `&`

The `&` operator is used to concatenate individual strings into a larger string. This can be used to embed the values of data elements into a text, like this:

```
outputText := "The price for the movie ticket is: $" & price & " including a weekend surcharge
of $" & weekend_surcharge
```

Data elements of a different basic data type (e.g. Float) will be automatically converted to strings before concatenated.

3.12.3. Embedded Expressions in a String

As a convenient alternative to concatenating strings with values using the `&` operator, the values may be embedded in a string using the `${...}` notation. You can put any expression between the curly brackets.

```
outputText := "${bonus_points} bonus points have been calculated for card ${bonus_card}"
```

Strings cannot be used within a `${...}` section, i.e. you cannot put quotes there.

Related Concepts.

- Section 3.12.2, “String Concatenation Operator `&`” [57]

3.12.4. Comparison Operators

The comparison operators are `=`, `<>`, `<`, `>`, `<=` and `>=`. They compare both operands and, depending upon the result, deliver the result as `true` or `false`.

```
age > 10
age <= 65
age = 18
name <> "Peter"
"Anton" < "Beatrice"

(10 < 12) = true
```

Checks for equality (`=`) or inequality (`<>`) can be done with any data type.

Relative comparisons like "less than" (`<`), "greater than" (`>`), "less or equal than" (`<=`) or "greater or equal than" (`>=`) can be done with Float, Integer, String, Date, Time and Timestamp values. Visual Rules uses simple lexicographical ordering for strings.

3.12.5. Logical Operators `AND`, `OR`, `NOT`

The `AND` operator corresponds to a logical AND operator. It compares two Boolean values and returns `true`, if both Boolean values are `true`.

```
 true AND true = true
 true AND false = false
false AND true = false
false AND false = false

age > 10 AND age < 18
```

The `OR` operator corresponds to a logical OR operator. It compares two Boolean values. If at least one of these Boolean values is `true`, the OR operator returns `true`:

```
 true OR true = true
 true OR false = true
false OR true = true
false OR false = false

age < 18 OR age > 65
```

The `NOT` operator reverses a logical value.

```
NOT true = false
NOT false = true

(age > 18) AND NOT (age > 65)
```

3.12.6. `BETWEEN` Operator

The `BETWEEN` operator is used to determine if a value belongs to an interval.

```
 5 BETWEEN [5,9] = true
 5 BETWEEN ]5,9] = false
 5 BETWEEN [1,9] = true
13 BETWEEN [1,9] = false
```

Interval limits are put in square brackets. A closed interval (brackets turned inside) indicates that the value limit is inclusive. An open interval (bracket turned to the outside) indicates that the value limit is exclusive. In the example above, `]5,9]` means that the value is greater than 5, but it does not equal 5.

3.12.7. Calling Functions

To call a function specify the function name followed by parentheses containing a list of parameters. Functions can have one, multiple or no function parameters.

Example 3.6. Calling functions

```
currentDate() = #2007-12-24#
sqrt(2)
startsWith("String", "Characters")
```

The examples above show the `currentDate()` function call without function parameters and function calls with one and two parameters.

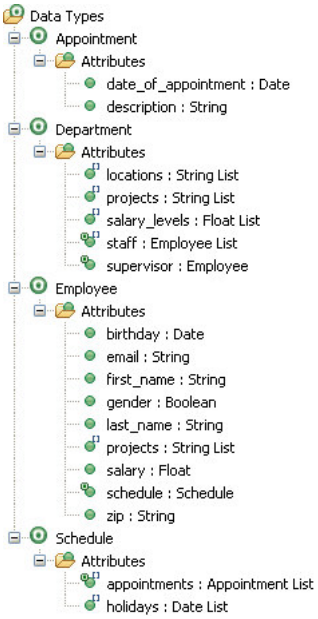
Related Concepts.

- Section 3.18, “Function” [81]

3.12.8. Accessing Attributes

Data elements of a structured type have one or multiple attributes. In order to refer to the value of a specific attribute of a structured data element, you write the name of the data element, followed by a dot (`.`) and the attribute name. E.g. `customer.name` refers to the value of the attribute `name` of the `customer`. If an attribute itself is a structure, repeated use of the dot is used to navigate to the desired attribute.

Example 3.7. Accessing attributes of structures



Assuming there are two data elements, `employee` of type `Employee` and `department` of type `Department`:

`employee.first_name`
: Value of the attribute `first_name` of `employee`

`employee.schedule.appointments[3].date_of_appointment`
: Value of the attribute `date_of_appointment` in the 3rd element of `appointments` in the `schedule` of `employee`

`employee = department.supervisor`
: Returns `true`, if the `employee` is the supervisor of `department`

Related Concepts.

- Section 3.14.3, “Structure” [74]
- Section 3.13, “Data” [67]

3.12.9. Accessing List Elements

Accessing a specific element of a list is accomplished by specifying the list, followed by an index enclosed in square brackets. Any expression can be used as the index, as long as it returns a whole number result.

In Visual Rules the first element of a list has index 1.

Example 3.8. Accessing elements in a list

```
list[3]
customerList[index + 1]
```

Related Concepts.

- Section 3.14.7, “Collection” [76]

3.12.10. `NULL`

The literal `NULL` has a special meaning. It indicates a missing value. Input or internal data elements can have the value `NULL`. It is possible to check if this is the case using this expression:

```
var = NULL
```

This expression returns `true` if the variable `var` does not have a value. Using a decision node you can thus, for example, query a non-initialized input data element and react accordingly.

3.12.11. `IN` Operator

The `IN` operator returns `true` if a value is present in a collection.

```
5 IN {1,2,3} = false
5 IN {1,5,3} = true
NOT (5 IN {1,2,3}) = true
```

Related Concepts.

- Section 3.14.7, “Collection” [76]

3.12.12. `AVAILABLE` Operator

The `AVAILABLE` operator can be used to check if an input data element was given a value. That is useful if the input data element is not required. There is a shorthand for the `AVAILABLE` operator which is simply a question mark.

```
AVAILABLE optionalParameter
optionalParameter ?
```

The `AVAILABLE` operator can only be used for input data elements. You cannot specify other expressions.

Related Concepts.

- Section 3.13.2, “Input/Output Data” [69]

3.12.13. `NAMEOF` Operator

The `NAMEOF` operator returns the name of a data element. For example,

```
NAMEOF price
```

will return the string `"price"`. The advantage of using the `NAMEOF` operator, instead of simply specifying the name as a string, is that the `NAMEOF` expression will correctly be updated whenever the data element is renamed.

It is also possible to use more complex expressions with the `NAMEOF` operator. This will simply return the whole expression as a string. For example,

```
NAMEOF shoppingcart.product[5].price
```

will produce the string `"shoppingcart.product[5].price"`. (Note: If the expression is enclosed in brackets, these will not be included in the resulting string.)

3.12.14. Collection Operators

If a data element is a collection, it can hold multiple values of the same type (other terms you may be familiar with for this kind of data element are "list" or "array"). A collection itself is defined by listing the desired elements in curly brackets. The elements in a collection are separated by commas. An empty collection is simply written as `{}`.

Example 3.9. Collection values

```
{ 1, 2, 3 }
{ "RED", "GREEN", "YELLOW", "BLUE" }
{ customerA, customerB, customerC }
{}
```

Two collections are unified using the plus operator. The result is a collection that contains the elements of the first collection and those of the other collection.

Example 3.10. Union of collections

```
collection1 + collection2
stringList + {"anotherString"}
```

The minus operator is used to produce a collection that is the "difference" between two other collections. The result is a collection that contains the elements from the first collection that are not in the second collection.

The operation takes into account the number of times an element is contained in the collections. Thus, if the first collection contains an element 7 times and the second collections contains this element 3 times then the result will contain that element 4 times.

Example 3.11. Difference of collections

```
collection1 - collection2
stringList - {"someString"}
```

The `INTERSECT` operator is used to determine the intersection of two collections. The result is a set that contains only those elements that are in both collections.

Example 3.12. Intersection of two sets

```
set1 INTERSECT set2

intersection := set1 INTERSECT set2 INTERSECT set3
```

Related Concepts.

- Section 3.14.7, “Collection” [76]

3.12.15. Collection Functions

There are special functions for collections available that can be used to easily sort, search, convert or filter the elements of collections. The first and second parameters of these functions are delimited by a colon instead of a comma. The second parameter is a special expression, because it is evaluated for each element of the collection and provides the values for sorting, filtering or else. Within these expressions, it is possible to use the word `THIS` to refer to the element from the collection currently evaluated. However, the word `THIS` can be left out when accessing attributes, unless it is needed to resolve ambiguity.

The following table lists all collection functions which are illustrated by examples further below.

Table 3.3. Collection functions

Collection function	Description
`sortAsc( collection : sortExpression )`	Returns a list sorted ascendingly according to the given sort expression.
`sortDesc( collection : sortExpression )`	Returns a list sorted descendingly according to the given sort expression
`exists( collection : condition )`	Returns `true`, if *at least one* element of the given collection fulfills the conditional expression
`forall( collection : condition )`	Returns `true`, if *all* elements of the given collection fulfill the conditional expresison.
`count( collection : condition )`	Returns the number of elements that fulfill the conditional expression
`first( collection : condition )`	Returns the first element in the collection that fulfills the conditional expression, or `null`, if no element is found.
`last( collection : condition )`	Returns the last element in the collection that fulfills the condition specified by the <THIS expression>, or `null`, if no element is found. <THIS expression> must be a boolean expression, i.e. it must evaluate to either `true` or `false`.
`min( collection : expression )`	Returns the element in the collection for which the expression evaluates to the lowest value.
`max( collection : expression )`	Returns the element in the collection for which the expression evaluates to the highest value.
`filter( collection : condition )`	Returns a collection that contains those elements of the given collection that fulfill the condition.
`select( collection : expression )`	Returns a collection whose elements are the result of the expression evaluated for every element of the given collection.
`rankAsc( list : sortExpression, element, maxElements )`	Inserts the element into the list at the right position so that the list remains correctly sorted ascendingly according to the sort expression. If the resulting list contains more than maxElements elements, the exceeding elements at the end will be removed. The remaining list is returned as the result. Note: This requires the given list to be already sorted ascendingly according to the sort expression.
`rankDesc( list : sortExpression, element, maxElements )`	Inserts the element into the list at the right position so that the list remains correctly sorted descendingly according to the sort expression. If the resulting list contains more than maxElements elements, the exceeding elements at the end will be removed. The remaining list is returned as the result. Note: This requires the given list to be already sorted descendingly according to the sort expression.

3.12.15.1. Sorting of Collections

`sortAsc()` and `sortDesc()` sort a collection by a given criterion. The criterion is defined by an expression specified as the second parameter. The result of the `sortAsc()` or `sortDesc()` function is the sorted collection. The original collection is left unchanged.

Example 3.13. Sorting collections

```
    /* Sorting numbers by their value: THIS */
sortAsc( { 8.2, 4.3, 6} : THIS) = {4.3, 6, 8.2}
sortDesc( { 8.2, 4.3, 6 } : THIS) = {8.2, 6, 4.3}

    /* Sorting strings by their length: length(THIS) */
sortAsc( { "longer", "very long", "tiny" } : length(THIS))

    /* Sorting customers descendingly by their account balance. */
    /* This will only work if the elements of the 'customers'   */
    /* collection have a 'balance' attribute.                   */
sortDesc( customres : THIS.balance )

    /* In the last example we could also omit the keyword THIS  */
sortDesc( customers : balance )
```

3.12.15.2. Searching Collections

The `exists()` and `forall()` functions test if a certain condition is fulfilled by at least one or all of the collection's elements, respectively. The condition is specified by an expression and must return a boolean value. `exists()` returns `true`, if at least one element fulfills the condition. `forall()` only returns `true`, if all elements fulfill the condition. Similarly the count() function determines exactly how many elements fulfill the condition.

Example 3.14. Searching collections

```
    /* Yes, there is one number greater than 5 ... */
exists( { 8.2, 4.3, 6} : THIS > 5) = true

    /* ... but not all numbers are greater than 5  */
forall( { 8.2, 4.3, 6} : THIS > 5) = false

    /* Is there a customer with a balance greater than $10,000?  */
exists( customers : balance >= 10000 )

    /* Are all customer accounts unlocked? */
forall( customers : NOT account.locked )

    /* How many customers have overdrawn their accounts? */
count( customers : balance < 0 )
```

The `first()` and `last()` functions find the first or last element of a collection that fulfills a condition. This is often useful in connection with sorted collections.

```
    /* The first/last customer with over 10000 dollars in his account */
first( customers : balance >= 10000 )
last( customers : balance >= 10000 )

    /* The customer that has minimally overdrawn his account */
first( sortDesc( customers : balance ) : balance < 0 )

    /* The customer that has *just* not overdrawn his account */
last( sortDesc( customers : balance ) : balance >= 0 )
```

3.12.15.3. Searching for maximums and minimums

The functions `min()` and `max()` search collections for the lowest or highest element according to a specific criterium.

Example 3.15. Searching for maximums and minimums

```
    /* The customer with the shortest name */
min( customers : length(name) )

    /* The wealthiest customer */
max( customers : balance )
```

3.12.15.4. Filtering Collections

The `filter()` function tests the elements of a collection whether they fulfill a certain condition. The resulting collection does only contain those elements that have fulfilled the condition. All other elements are not in the resulting collection. The given <THIS expression> must have a boolean result. The `filter()` function leaves the original collection unchanged.

Example 3.16. Filtering collections

```
    /* Returns the numbers greater than 5: THIS > 5 */
filter( { 8.2, 4.3, 6} : THIS > 5) = {8.2, 6}

    /* Returns the strings shorter than 6 characters: length(THIS) < 6 */
filter( { "longer", "very long", "tiny" } : length(THIS) < 6)

    /* Returns all customers with at least $10,000 on their accounts */
filter( customers : balance >= 10000 )
```

3.12.15.5. Converting Collections

The `select()` function is used to convert the elements of a collection into something else. The conversion is specified by the <THIS expression> which is evaluated for every element. The result of the `select()` function is a collection with the same number of elements as the original collection but every element is the result of the evaluation of the <THIS expression>.

Example 3.17. Converting collections

```
    /* Converts all numbers to strings */
select( { 8.2, 4.3, 6} : toString(THIS)) = { "8.2", "4.3", "6" }

    /* Returns a collection of customer names */
select( customers : firstname + " " + name)

    /* Returns the customer numbers of all customers with at least */
    /* $10,000 on their accounts                                   */
select( filter( customers : balance >= 10000 ) : customerno)
```

3.12.15.6. Ranking functions

The ranking functions are used to incrementally build sorted lists from single elements, e.g. a list of the best customers according to revenue. The `rankAsc` or `rankDesc` functions take an already sorted list and insert a new element at the right position according to a given sort expression. The functions also make sure that the list does not exceed a given size.

The ranking functions are usually used within an Assignment element after a Repeat element, like in the following example. The assignment in the example would be positioned after a Repeat element that would go over the complete customer base - let's assume a million customers - and assign each one to the `currentCustomer` data element. The `bestCustomers` list would then always contain the 10 best customers according to revenue found so far.

Example 3.18. Ranking functions

```
    /* Determine 10 best customers (Assignment within a Repeat going over all customers) */
bestCustomers := rankDesc(bestCustomers : revenue, currentCustomer, 10)
```

The advantage of the ranking functions over a sort function is that it can work with elements that are available one by one, while the sort function would require to have *all* customers available when it is called. All customers would have to be loaded to the computer memory in order to perform the sort, which is not practical in many situations.

3.12.16. Map Operators

Visual Rules supports Map data elements. Maps contain multiple values that are not simply identified by their index, but by another value (called a key). Values and keys can be of any data type, including structured types. To access and set values in a map, you use square brackets and put the key value inbetween. E.g. in a `String -> String Mapping`, you can create an entry with the following assignment:

Example 3.19. Set map value

```
state["IN"] := "Indiana"
```

The key and value types can be any simple or complex type. E.g. it is possible to have a `Customer -> Contract` mapping.

To merge two maps, you use the `ADD` assignment, like this. The result is a map that contains both the entries from `map1` and `map2`.

Example 3.20. Merge maps

```
map1 ADD map2
```

You can remove an entry by specifying its key in a `REMOVE` assignment:

Example 3.21. Remove element from map

```
map REMOVE key
```

And you can empty a map (remove all entries) with the `CLEAR` assignment:

Example 3.22. Clear map

```
map CLEAR
```

Related Concepts.

- Section 3.5.2.1, “ADD, REMOVE and CLEAR Assignments” [36]

3.12.17. Map Functions

There are some built-in functions specifically used for maps. The functions `keys()` and `values()` give access to only the keys or the values of a map, respectively. `keys()` returns a set of all the keys, while `values()` returns a collection of the values.

`count()` can now be used to count the number of entries/keys in a map. `copy()` creates a copy of a map and all its elements. The `copy()` function performs a deep copy, i.e. the map and all contained elements are copied.

The following table lists all map functions.

Table 3.4. Map functions

Map function	Description
`copy (Any -> Any Mapping from) : Any -> Any Mapping`	Returns a (deep) copy of the map and all contained elements.
`count (Any -> Any Mapping map) : Integer`	Returns an integer value with the number of elements (i.e. keys) of the map.
`keys (Any -> Any Mapping map) : Any Set`	Returns a set of all keys of the map.
`values (Any -> Any Mapping map) : Any Collection`	Returns a collection of all values of a map.

3.12.18. `new` Operator

The `new` operator creates a new instance of a structure (or exception). The syntax is `new <name of structure>`, e.g.

```
k := new Customer
```

The newly created object is initialized with the default values specified for the structure's attributes.

It is possible that there are structures that are not createable and you will get an error marker if you use the new operator.

These structures are external and imported. You have to contact your technical expert to get a solution to this problem.

Related Concepts.

- Section 3.14.3, “Structure” [74]
- Section 3.14.6, “Exception” [76]

3.12.19. `isA` and `asA` Operators

The `isA` and `asA` operators are useful for working with structures that are sub types of each other. They allow to check for the actual data type of a value and to convert a data type to a sub type thereof.

In order to test for the specific type of a structured value, you can use the `isA` operator. This will return `true` if the value is of the specified data type or any sub type thereof, otherwise `false`.

```
person isA Customer
```

The `asA` operator can be used to tell Visual Rules that it should consider a value to be of the given sub type. This is useful in order to access attributes that are defined on the sub type only.

For example, a data element of type `Person` may actually contain a value of a sub type. In this case it is a `Customer`. In order to access the attribute `customerId`, which only a `Customer` has, but not a `Person`, you need to first use the `asA` operator to change the type to `Customer`, and then access the attribute with the dot operator, like this:

```
(person asA Customer).customerId
```

The `isA` operator in Visual Rules is equivalent to the `instanceof` operator in Java. Also, the `asA` operator in Visual Rules is equivalent to a *cast* in Java.

Related Concepts.

- Section 3.14.3, “Structure” [74]
- Section 3.14.4, “Super Types” [75]

3.12.20. Operator Precedence

The following table shows all operators available in Visual Rules.

Operators with a higher priority are evaluated before operators with a lower one. Operators with the same priority are evaluated from left to right in the expression. Parentheses have the highest priority and can be used to enforce the exact order for evaluating an expression.

Table 3.5. Operators for expressions

Priority	Operator	Meaning
14	`()`	Highest precedence with parentheses
13	`.`	Attribute access
12	`[]`	List element access per index (first element has index 1)
11	`THIS`	Element access within collection functions
10	`asA`	Type conversion
9	`-` (unary)	Negation (Any, Float, Integer)
9	`NOT`	Logical negation (Any, Boolean)
9	`AVAILABLE` or `?`	Checks if an input data element has a value
9	`NAMEOF`	Returns the name of a data element
8	`*`	Multiplication (Any, Float, Integer)
8	`/`	Division (Any, Float, Integer)
8	`DIV`	Whole number division (Any, Float, Integer)
8	`MOD`	Remainder of whole number division (Any, Float, Integer)
7	`+`	Addition (Any, Float, Integer)
7	`-`	Subtraction (Any, Float, Integer)
7	`INTERSECT`	Intersection of collections
6	`&`	Concatenation (Any, String)
5	`<`	Less than (Float, Integer, String, Date, Time, Timestamp)
5	`>`	Greater than (Float, Integer, String, Date, Time, Timestamp)
5	`<=`	Less than or equal to (Float, Integer, String, Date, Time, Timestamp)
5	`>=`	Greater or equal to (Float, Integer, String, Date, Time, Timestamp)
5	`BETWEEN`	Checks whether a value lies within the specified interval (see below) (Number, String, Date)
5	`IN`	Checks whether a value is present in a collection
4	`isA`	Checks whether a value is of a specific type
3	`=`	Equals operator
3	`<>`	Not equals operator
2	`AND`	Logical AND operation (Boolean)
1	`OR`	Logical OR operation (Boolean)

3.13. Data

Rules need data to perform their tasks. Every rule in Visual Rules clearly specifies the data that goes into the rule (input data) and the data that comes out of the rule as a result (output data). Additionally, a rule may define data that it uses internally only (internal data and constant data).

Data can be defined in different locations within your rule model. The best way is to define data on the rule level, meaning that all data elements defined there are only visible to that specific rule. Input data and output data

defined on the rule level clearly indicate what data will go into that rule and what the results will be. When rule A is called by another rule B, rule B will have to specify values for all input data defined for rule A. Rule B will afterwards be able to read any results from the defined output data of rule A.

Other possible locations for data definitions are rule packages or the rule model itself. Data defined on a rule package is shared by all the rules in that package and any of its sub packages. This is convenient if multiple rules need the same data. In that case these rules go into the same package and the common data is defined on the package. For this reason you have to specify a unique name for each data element to clearly identify the data in the rules.

The complete set of input, output and internal data of a rule is the sum of all data elements defined for the rule plus all data elements defined for the rule package and all packages above that. In other words, a rule has access to all data elements that can be found by going up the package hierarchy starting from the rule up to the rule model (which is the top level rule package). The sum of all data available to a rule is also called the "data context" of the rule.

Related Concepts.

- Section 3.14, “Data Type” [71]
- Section 3.4, “Flow Rule” [29]
- Section 3.3, “Rule Package” [26]

3.13.1. Common Data Properties

All different kinds of data definitions (input/output, internal, constant) have common properties, e.g. every data element has a name and a description. The following table lists all common data properties and their meanings.

Name
: Every data element must have a name that is used in expressions to refer to the value of that data element. Names can consist of letters and numbers but they must start with a letter. They cannot contain whitespace. However, an underscore _ is a valid character. For example, valid names are: `customer`, `CREDITLIMIT`, `preferredCustomers`, `this_is_a_valid_name`.

It's a convention for all data elements to have a lowercase letter as first character, except for constants which should have uppercase letters only. When the name contains multiple words, then either the first letter of each word should be written in uppercase (e.g. `preferredCustomers`) or the words should be separated by underscores (`this_is_a_valid_name`).

Two data elements cannot have the same name when they are defined on the same rule or the same rule package. However, two data elements defined on different rules or different rule packages can have the same name.

Description
: Each data element can have a description. Descriptions should fully explain the meaning of the data element and its value. Users can access descriptions from many other places in Visual Rules, e.g. from within the Code Assistant when entering a rule expression.

Default Value
: If a default value for a data element is specified, then this will be its initial value until it is set to a different value. If a default value is not specified, then implicit default values for the data type apply. For example, a data element of type `Float` will have a default value of 0 (Zero) if not defined differently. A structure is created by default. To suppress the creation of a structure specify `null` as the default value.

  Default values can also be specified for structured data elements or data elements containing multiple values.

Type
: All data elements have a data type. A data type specifies what kind of values that data element can contain. There are several built-in data types like `Date` or `String` or `Float`. These data types can be extended by user-defined data types, especially also structured types with multiple attributes, e.g. a `Customer` type that defines the attributes of a customer: `first_name`, `last_name`, `gender`, `birthdate` and `address`.

  There is also a built-in data type called `Any`. This is the default type of all newly created data elements and means that this element can have any kind of value. This is convenient because it allows the rule author to initially ignore data types when writing rules.

Multiple
: A data element can be multi-valued which means that it can hold multiple values of the same type. These are called collections or maps. A data element is a collection or map when the **Multiple** attribute is set.

  There are special assignment rule elements (ADD, REMOVE, CLEAR) for working with collections and maps. Also, the Repeat element (more precisely: **Repeat for each of multiple elements**) is very useful when a rule has to look at the individual elements of a collection.

Implementation
: A data element which is multi-valued (see above) can be implemented in four different ways. It can be either a collection, a list, a set or a map. See the related concepts Section 3.14.7, “Collection” [76] and Section 3.14.8, “Map” [78] for details.

Related Concepts.

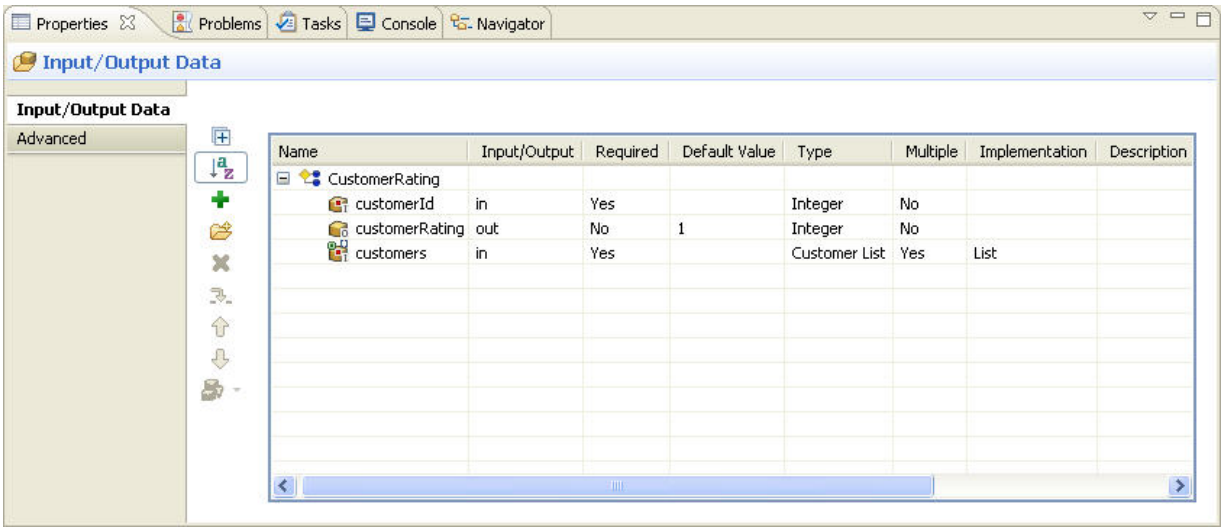
- Section 3.14, “Data Type” [71]
- Section 3.14.7, “Collection” [76]
- Section 3.14.8, “Map” [78]

3.13.2. Input/Output Data

Input/Output data is used to specify data that goes into rules and comes out of them as a result. Each data element in this category can be either input or output or both input and output. This is defined by the **Input/Output** setting.

Additionally, input data elements can be defined to be **required**. That means that a value must always be specified for this input element when the rule is called. When the input is not required, a value is optional.

Required input data will be indicated by a small red dot in the element's icon.



Input data can be defined both on the rule level or on the rule package level. Values for input data defined on the rule level will always have to be specified when the rule is reused. Values for input data defined on the rule package level will have to be specified only if the rule reusing the other rule is not located in that same package or any sub-package thereof. In other words, input data on the rule package will have to be initialized only when a rule of that package is reused from *outside* of that package.

Related Tasks.

- Section 4.6.1, “Defining Input/Output Data Elements” [140]
- Section 4.6, “Working with Data” [140]

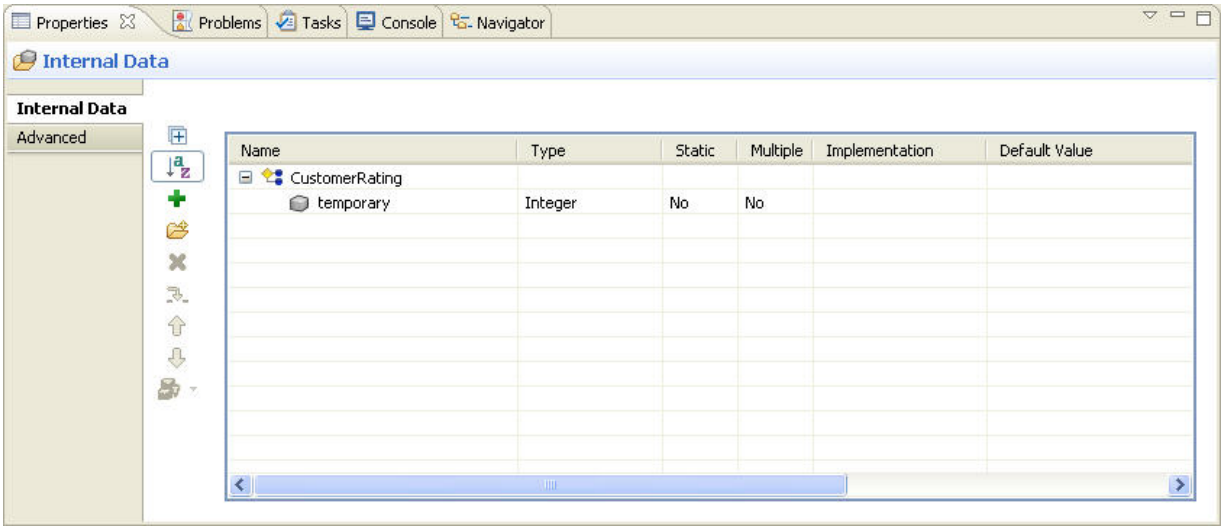
3.13.3. Internal Data

Internal data elements are used by rules internally only, e.g. to hold intermediate results. Internal data elements should be defined on the rule level to ensure that they can only be used by that one rule. However, internal data el-

ements can also be defined on the package level and are then shared by all rules in this package or in any of its sub-packages. In that fashion, rules can use internal data elements to exchange data.

Internal data elements can be **static**. In that case their value is initialized only once when the rules are executed for the first time. Afterwards they retain their value between rule executions. Static data elements are ideal to hold large amounts of reference data that does not change often or not at all.

The values of static data elements are shared across multiple rule executions. This includes rule executions that happen in parallel, i.e. at the same time. So care must be taken when values of static data elements are changed, because that change is immediately visible to all ongoing rule executions.

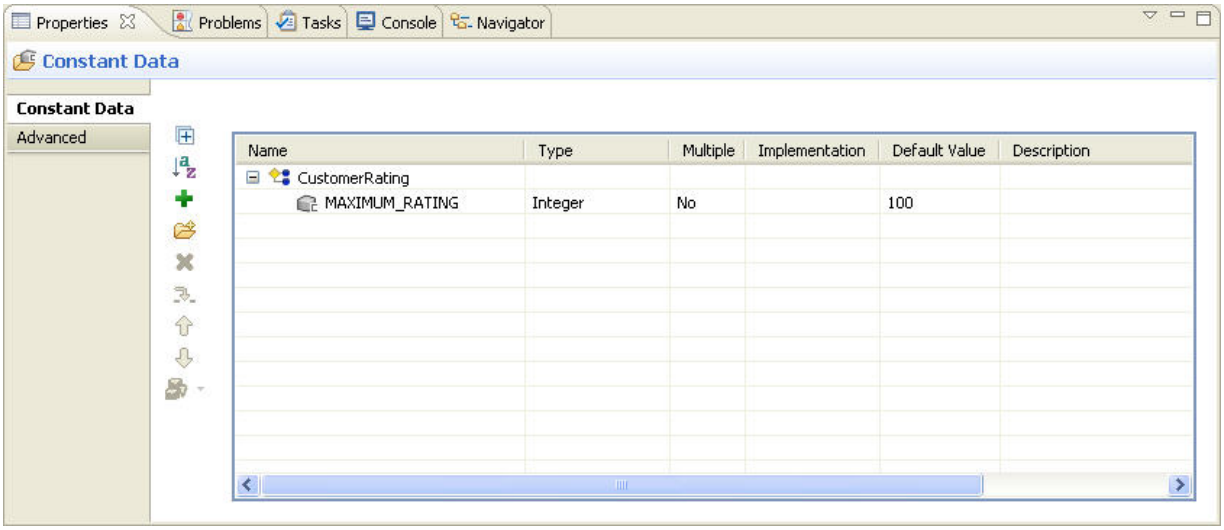


Related Tasks.

- Section 4.6.2, “Defining Internal Data Elements” [141]
- Section 4.6, “Working with Data” [140]

3.13.4. Constant Data

There is a third category of data called constant data. The values of constant data - as the name implies - cannot be changed by any rule. Constants usually define values that parameterize rules, e.g. instead of defining a credit limit within a rule, you can specify the limit as a constant and then refer to that constant from within your rule.



Related Tasks.

- Section 4.6.3, “Defining Constant Data Elements” [142]

- Section 4.6, “Working with Data” [140]

3.14. Data Type

All data elements have a data type. A data type specifies what kind of values the data element can contain. There are several built-in data types like `Date` or `String` or `Float`. A data element of type `Date` can contain only date values. It can not contain a number or some text, only dates.

There is also a built-in data type called `Any`. This is the default type of all newly created data elements and means that this element can have any kind of value. A data element of type `Any` can also contain a data value, but also a number or some text. This is convenient because it allows the rule author to not have to consider data types initially when writing rules. However, it is also easier to make mistakes when using the `Any` type. E.g. it is perfectly fine to multiply two `Any` values in a rule. However, if they are actually a date and a string, then multiplication doesn't make any sense and will cause the rule to fail when it is executed. So it is always a good idea to not "overuse" the `Any` type.

In addition to the built-in data types it is also possible to have user-defined data types. User-defined data types are located in the **Data Types** folders. They can be defined on the rule level. On the other hand, it is advisable to defined them on the package or even rule model level, so that they are shared among all the rules in the model.

There are different kinds of user-defined data types. The most important one is a structure. Structures are a collection of multiple values (called attributes) that belong together, e.g. a `Customer` structure defines the attributes of a customer: `first_name`, `last_name`, `gender`, `birthdate` and `address`. A data element of type `Customer` can contain a value for each of these attributes.

Other kinds of user-defined data types are enumerations, type aliases and exceptions. These and all the other kinds of data types will be explained in detail in the following sections.

It's a convention for data type names to have an uppercase letter as first character.

Related Concepts.

- Section 3.14.1, “Basic Data Type” [71]
- Section 3.14.2, “Type Alias” [74]
- Section 3.14.3, “Structure” [74]
- Section 3.14.5, “Enumeration” [76]
- Section 3.14.6, “Exception” [76]
- Section 3.14.7, “Collection” [76]

Related Tasks.

- Section 4.6, “Working with Data” [140]
- Section 4.7, “Working with Data Types” [150]
- Section 4.6.13, “Displaying Data Types” [148]

3.14.1. Basic Data Type

Visual Rules supports the following basic data types:

`Any`
: The `Any` type is used to represent a value of, well, any type. It can be a `String`, a `Date`, a `Float` or any custom data type. This is convenient because it allows the rule author to initially ignore data types when writing rules. All operations can be applied to an `Any` value. However, the operation may fail if the `Any` value has an incompatible type. Default value: -

`Float`
: The `Float` type is used to represent decimal numbers. Default value: 0.

`Integer`
: The `Integer` type is used to represent whole numbers without a fractional part. Default value: 0.

`String`
: A `String` contains a sequence of characters and can contain any kind of text. Default value: "" (empty string).

`Boolean`
: A `Boolean` value represents a logical result and can be either `true` or `false`. Default value: `false`

`Date`
: A `Date` consists of entries for year, month and day. Default value: current date.

`Time`
: A `Time` value refers to a specific time of day and consists of hour, minute, second and millisecond. Default value: current system time.

`Timestamp`
: A `Timestamp` is a combination of a `Date` and a `Time`, thus defining a day and a time. Default value: current system time.

Related Tasks.

- Section 4.6, “Working with Data” [140]
- Section 4.6.13, “Displaying Data Types” [148]

3.14.1.1. Any

`Any` is the most general data type in Visual Rules. A data element of this type can hold values of any type, just like the name indicates. It can be a `String`, a `Date`, a `Float` or any other built-in or custom data type. All operations can be applied to `Any` values. For example it is possible to add, subtract, multiply, divide and compare two `Any` values. This makes the `Any` data type a very convenient choice for many data elements. This is also the reason why `Any` is the default type for every newly created data element.

When the rule is executed, Visual Rules will look at the actual data types of the `Any` values and perform operations accordingly. This may cause Visual Rules to convert a value from an incompatible type to a compatible one. For example, if an `Any` value is added to another `Any` value, Visual Rules will check whether they are both numbers. If one or both are not numbers, then Visual Rules will try to convert them to numbers and then add them accordingly. This way, it is possible to have numbers stored as `Strings` and still be able to do computations, because Visual Rules will try to convert the string into a number whenever necessary.

Note however that these type conversions may fail, if e.g. the string does not contain a number. A string "Hello" cannot successfully be converted to a number, thus an add operation will fail during rule execution and Visual Rules will create an exception. So care must be taken that these situations do not arise when rules are using data of type `Any`. Therefore, it is always a good idea to use more specific data types instead of `Any` wherever possible.

3.14.1.2. String

A String is a collection of characters, in other words some text. Strings in Visual Rules are always enclosed in double quotes.

Example 3.23. Strings

- `"This is a string"`
- `"He said, \"Hello\""`
- `"1st line\n2nd line\n3rd line"`
- ```
  "This is a string
  that continues across
  multiple lines"
  ```

A double quote in a string must be written as `\"`. Strings can contain line breaks, like in the fourth example above.
  ```

The following character combinations (prefixed with a backslash) have special meanings in strings:

`\"`
: double quotes

`\n`
: new line

`\t`
: tab character

`\\`
: backslash

3.14.1.3. Boolean

Boolean values can take only two values. The words `true` or `false` are used for this in Visual Rules.

Example 3.24. Boolean values

- `true`
- `false`

Alternatively, Boolean values can also be written in capital letters only, like this: `TRUE` or `FALSE`.

3.14.1.4. Date

A Date value always starts and ends with a `#` character. The actual Date value begins with the number for the year, followed by a hyphen, the number for the month (1 to 12), another hyphen and the day (1 to 28/29/30/31). Please be aware that this format has to be adhered to, regardless of the regional settings made for your system.

Example 3.25. Date values

- `#2000-1-1#` (corresponds to January 1, 2000)
- `#2008-12-31#` (corresponds to December 31, 2008)
- `#20-3-11#` (corresponds to March 11 in the year 20)

The expression `currentDate() = #2007-2-29#` is true, if the current date is February 29, 2007.

3.14.1.5. Time

A Time value always starts and ends with a `#` character. The actual Time value begins with the hour (0 to 23), followed by a colon, the minute (0 to 59), followed by a colon, the second (0 to 59) optionally followed by a period and the milliseconds (0 to 999). Please be aware that this format applies regardless of the regional settings made for your system.

Example 3.26. Time values

- `#10:25:30#` (corresponds to 10 hours, 25 minutes and 30 seconds)
- `#10:25:30.010#` (corresponds to 10 hours 25 minutes 30 seconds and 10 milliseconds)
- `#23:00:00.000#` (corresponds to 23 hours)

3.14.1.6. Timestamp

A Timestamp is composed of a date and a time value. It always starts and ends with a # character. The actual Timestamp begins with a date value, followed by a space and the time value. The time value consists of hours, minutes and seconds (separated by colons) followed by a period and a value for nanoseconds with a maximum length of 9 digits.

Example 3.27. Timestamp values

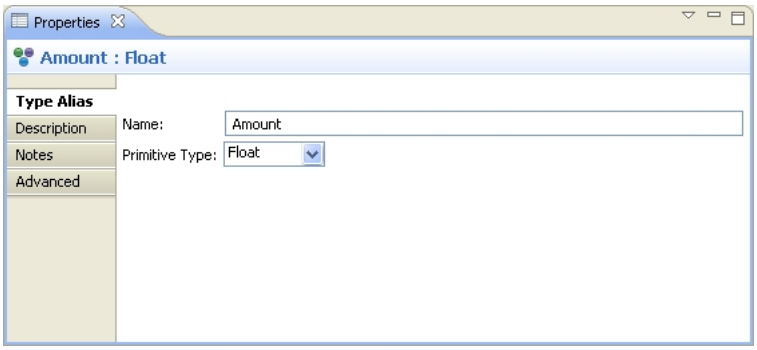
- `#2000-1-1 10:25:30.0#` (corresponds to January 1, 2000 at 10 o'clock, 25 minutes and 30 seconds)
- `#2000-1-1 10:25:30.010#` (corresponds to January 1, 2000 at 10 o'clock, 25 minutes, 30 seconds and 10 milliseconds)
- `#2000-3-11 23:00:00.000123456#` (corresponds to March 11 in the year 20 at 11 p.m. and 123456 nanoseconds)

3.14.2. Type Alias

Type aliases are user-defined data types that are basically synonyms for built-in data types. E.g. you may want to have a data type called `Amount` or `Rate` instead of using the built-in type `Float`. A type alias can be used everywhere the built-in type could be used, too.

In addition to the built-in types however, a type alias can have additional settings. These settings are different depending on the basic data type used, e.g. it would make sense to define fixed-point numbers for an alias data type `Amount`.

These additional settings for the type alias can only be inserted in the **Rule Integration** perspective. Maybe contact your technical expert if you need additional settings for an alias type.



Related Concepts.

- Section 3.14.1, “Basic Data Type” [71]

Related Tasks.

- Section 4.7, “Working with Data Types” [150]

Related References.

- Section 5.6.8.2, “Type Alias Tab” [257]

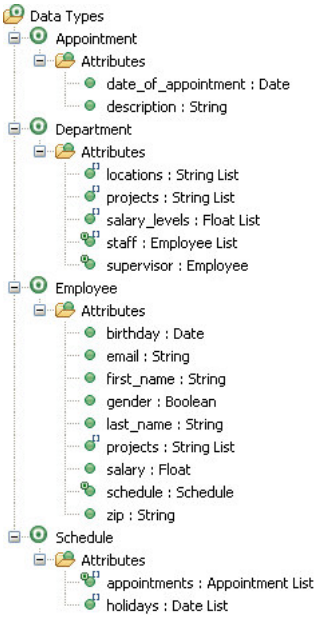
3.14.3. Structure

Structures are user-defined data types. Structures are a collection of multiple values (called attributes) that belong together. A data element of a structured type can hold a value for each of these attributes.

Attributes can have a basic data type (e.g. `Float`, `String`, `Boolean`, `Date`, etc.) or in turn be a structure or any other user-defined data type.

Example 3.28. Structures `Department`, `Employee`, `Appointment` and `Schedule`

Four data types are shown in the following picture: `Department`, `Employee`, `Appointment` and `Schedule`. The attributes for each data type are listed below it. The `Employee` data type, for example, has the attributes `first_name`, `last_name`, `gender`, etc.



Access to the attributes is done using dot notation. If a variable, for example, is called `employee` and has the data type `Employee` from the picture above, the expression `employee.first_name` designates the first name of the employee. `employee.schedule.appointment` are similarly the appointments from the schedule of the employee.

Structures in Visual Rules can define a default value including default values for some or all of the attributes. These default values are used whenever a data element of that type is initialized (and does not define different default values on its own).

Related Concepts.

- Section 3.14.1, “Basic Data Type” [71]

Related Tasks.

- Section 4.7, “Working with Data Types” [150]

Related References.

- Section 5.6.8.1, “Data Types Tab” [256]

3.14.4. Super Types

Structures can be derived from existing structures. The derived structure is called a "sub type" of the original type, which itself is called the "super type" of the derived structure. For example, you may have a structure named `Car` which is a sub type of `Vehicle`, or a structure named `Customer`, which is a sub type of `Person`. In Visual Rules it is possible to specify the super types of a structure on the **Super Types** tab in the **Properties** view.

Every structure inherits the attributes of all its super types, but may also define additional attributes.

Related Concepts.

- Section 3.12.19, “`isA` and `asA` Operators” [66]

Related Tasks.

- Section 4.7, “Working with Data Types” [150]

Related References.

- Section 5.6.8.6, “Super Types Tab” [260]

3.14.5. Enumeration

An enumeration is a user-defined data type that explicitely lists all possible values it can have. These possible values are called literals.

Example 3.29. Enumeration `Color`

An enumeration `Color` defines the possible values (literals) `BLUE`, `GREEN`, `RED` and `YELLOW`. A data element of type `Color` can thus only have one of these values. The value is referred to by specifying the enumeration name, followed by a dot and the literal name, e.g. `Color.BLUE`. Thus, a data element `color` of type `Color` can be assigned the color "blue" like this:

```
color := Color.BLUE
```

Related Tasks.

- Section 4.7, “Working with Data Types” [150]

Related References.

- Section 5.6.8.5, “Literals Tab” [260]

3.14.6. Exception

An exception is a user-defined data type. Exceptions are used for Visual Rules' exception handling capabilities, particularly the Return Exception and Handle Exception rule elements. As such, it should be considered a rather technical concept and its use possibly be restricted to more technical rules.

An exception is a special kind of structure. Its attributes are used to hold information about the "exceptional" situation that occurred during rule execution.

Related Concepts.

- Section 3.14.3, “Structure” [74]
- Section 3.5.10, “Return Exception” [42]
- Section 3.5.11, “Handle Exception” [43]

Related Tasks.

- Section 4.7, “Working with Data Types” [150]

Related References.

- Section 5.6.8.1, “Data Types Tab” [256]

3.14.7. Collection

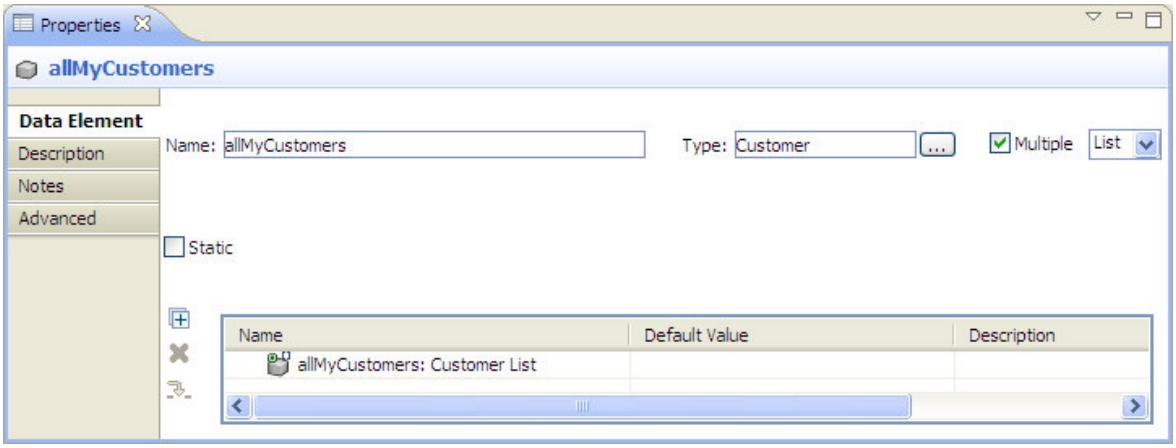
A data element can be a collection which means that it can hold multiple values of the same type (other terms you may be familiar with for this kind of data element are "list" or "array"). A data element is a collection when the **Multiple** property is set.

There are three different kinds of collections available: List, Set and Collection.

List
: A **List** contains multiple elements in a fixed order. As a consequence you can access the elements of a list using an index, e.g. `customer[3]` for the third element of the list `customer`.

  Lists can be empty, i.e. they don't contain any elements. Lists can contain the same element multiple times. Duplicates are not eliminated automatically as is the case with sets.

  Lists are useful if the order of the elements is important. Two lists are equal if they contain the same elements in the same order.



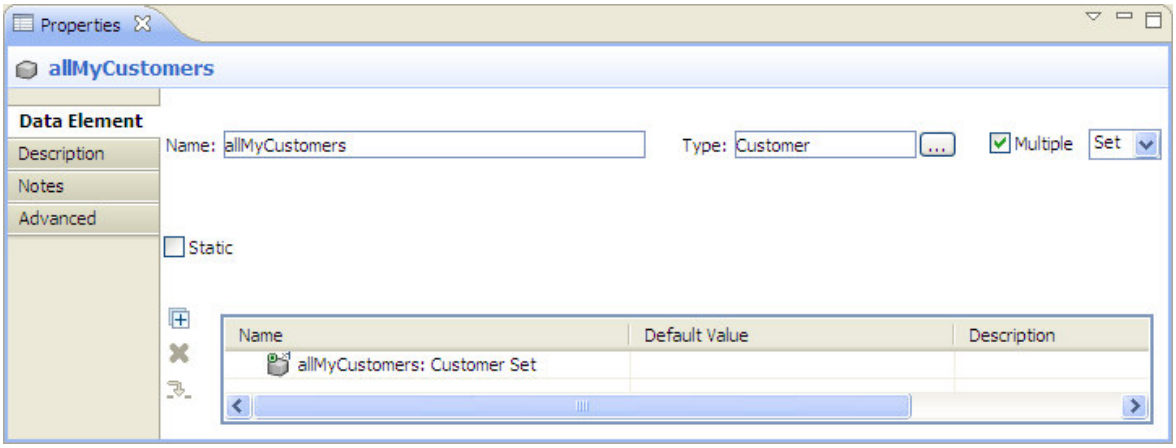
Set

A **Set** is a collection of multiple elements that automatically eliminates duplicates. If an element is added to a set that is already contained in the set, nothing happens. This is very useful if duplicates are undesired.

The most important advantage of a set is the much higher performance of the IN operator (to check if a specific element is contained in the set) compared to a list or a collection. This is especially true if the set contains a lot of elements.

The elements of a set don't have a specific order and indexed access is consequently *not* possible. Accessing the elements is done via the Repeat rule element.

Two sets are equal if they contain the same elements.



Collection

If a data item is a **Collection**, the elements of this collection don't have a defined order and indexed access with square brackets (e.g. `customer[3]`) is consequently *not* possible. The collection can contain the same element multiple times. Duplicates are not eliminated automatically as is the case with sets.

Accessing the elements is done via the Repeat rule element.

Two collections are considered equal if they contain the same elements the same number of times, independent of their order.

You cannot manually define a collection with Visual Rules Modeler. However, collections may appear in imported data models (e.g. when importing JavaBeans).

The following table illustrates the most important differences between Collection, List and Set:

	Indexed access allowed?	**Can contain duplicates?**	**IN Operator**
List	yes	yes	slow

	Indexed access allowed?	Can contain duplicates?	IN Operator
Set	no	no	fast
Collection	no	yes	slow

Related Concepts.

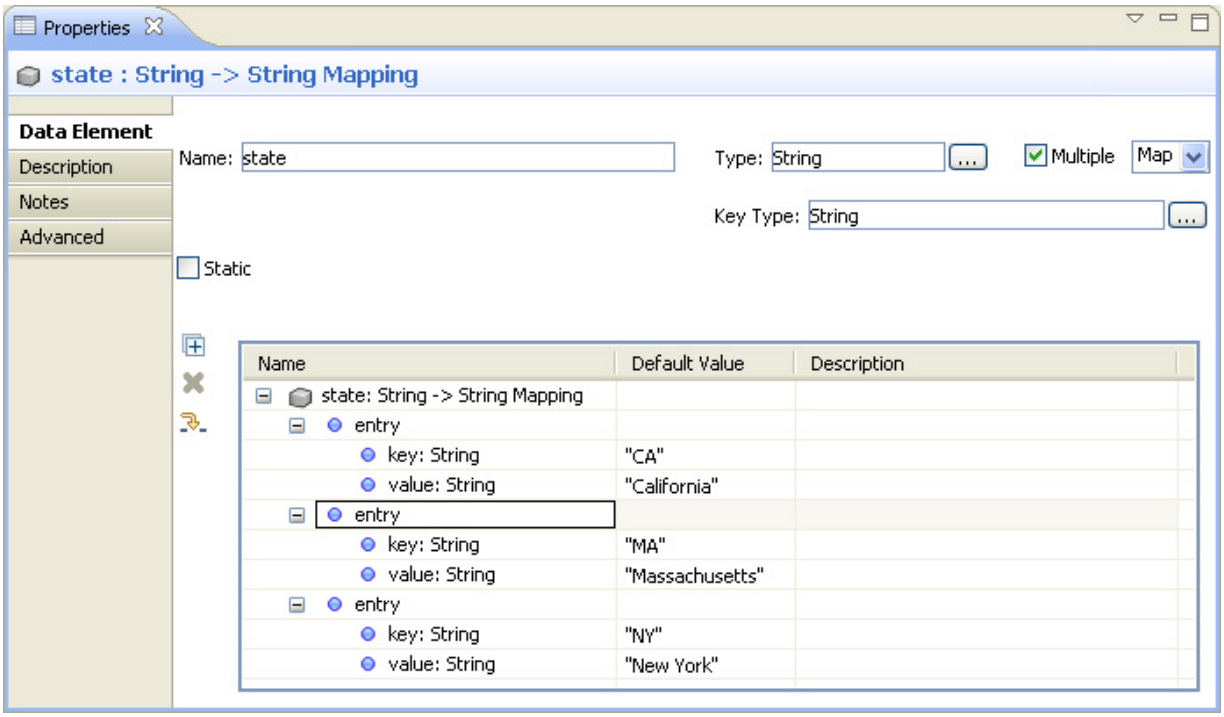
- Section 3.12.14, “Collection Operators” [60]
- Section 3.12.15, “Collection Functions” [61]
- Section 3.5.8, “Repeat” [40]

3.14.8. Map

A **Map** is a collection of multiple elements that are each identified by a unique key. Values and keys can be of any data type, including structured types. The elements of a map don't have a specific order and indexed access is consequently *not* possible. Accessing the elements is done via the key only.

The following screenshot shows a data element named `state`, which is a simple `String -> String Mapping`. The default value has three entries for the states CA, MA and NY.

To define a map, **Multiple** must be activated and the implementation has to be set to **Map**. You can then enter a type for the keys (**Key Type**), in addition to the type for the values (**Type**).



Related Concepts.

- Section 3.12.16, “Map Operators” [64]
- Section 3.12.17, “Map Functions” [65]
- Section 3.14.7, “Collection” [76]

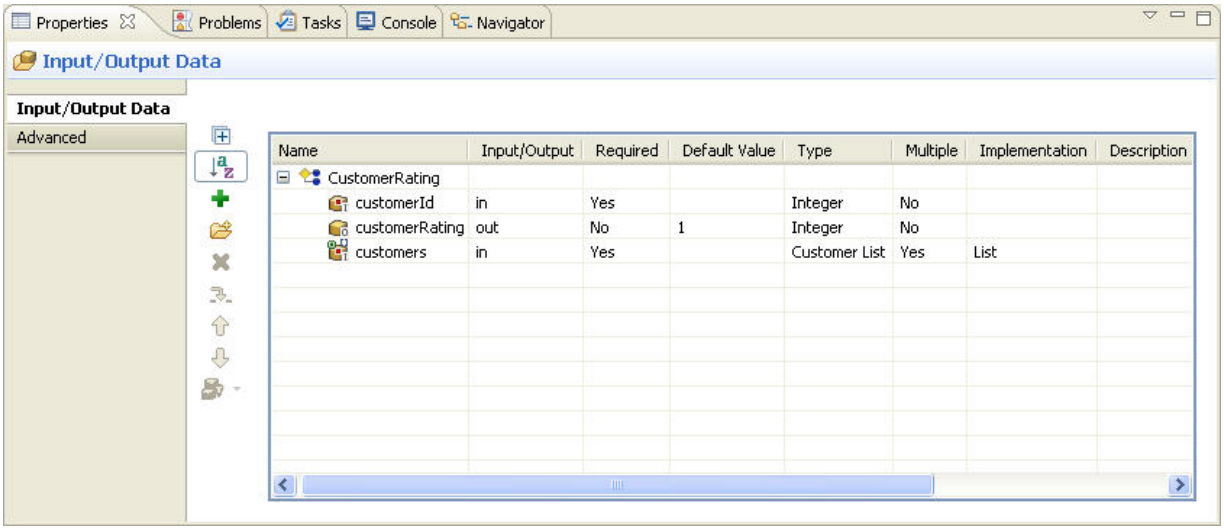
3.15. Description and Note

Almost all elements of a rule model can have a description or notes attached to them, e.g. rules, rule elements, data, actions, types and many more. Every element can have one description and/or multiple notes.

Element descriptions are shown in many places within the Visual Rules user interface to make it easy for the rule author to quickly understand the rule model. Thus it is very important that descriptions contain concise information about every element.

Notes are used to leave editorial comments about elements. For example, a rule author may attach notes to elements of the rule model that are still incomplete, so he or she doesn't forget. Every note is annotated with the information about who created it and when, so notes can also be used for the communication within the team. A business analyst may leave notes to explain what he or she would like to see changed and another member of the team picks up these notes to actually do the changes.

Descriptions and notes of selected elements can be viewed and edited on the corresponding tabs in the **Properties** view. Additionally, there is an editable description column in many tables displayed on other tabs. For example, the descriptions for all input/output data elements are also visible on the **Input/Output Data** tab.



The rule editor displays descriptions right next to every rule element. Notes are displayed to the right of the rule and connected to the corresponding rule element with a line.

Related Reference.

- Section 5.6.1.1, “Description Tab” [229]
- Section 5.6.1.2, “Notes Tab” [230]
- Section 3.3, “Rule Package” [26]

3.16. Action

Actions represent the consequences of rules. When a rule is executed it can fire actions as a consequence to decisions or computations. The Fire Action rule element is used to do this.

Actions can be defined on the rule level, so only that rule can fire that action. But actions can also be defined on the rule package or rule model level. In that case they are shared by all rules in that package or rule model, respectively.

Actions are identified by their names. Accordingly, the Fire Action rule element specifies an action name to indicate which action should be fired. The value of the action is set to `true` whenever this happens. Within expressions it is possible to refer to that boolean value simply by using the action name.

A rule calling another rule using the Call Flow Rule or Call Decision Table elements can look at the values of all the actions the called rule may have fired. This way, actions can be considered one kind of "output" of rules.

Actions have a type. The default type is "Standard" which is one of the built-in action types. Actions of type "Standard" do not have any special behavior when fired. See the section about action types to read about other built-in and custom action types.

Related Concepts.

- Section 3.5.3, “Fire Action” [37]

- Section 3.17, “Action Type” [80]

Related Tasks.

- Section 4.3.12, “Editing a Fire Action Element” [114]

3.16.1. Action Settings

Depending on the action type additional action settings may be necessary that are used to initialize the action. These are specified on the **Action Settings** tab. See the reference sections about the built-in action types for further details.

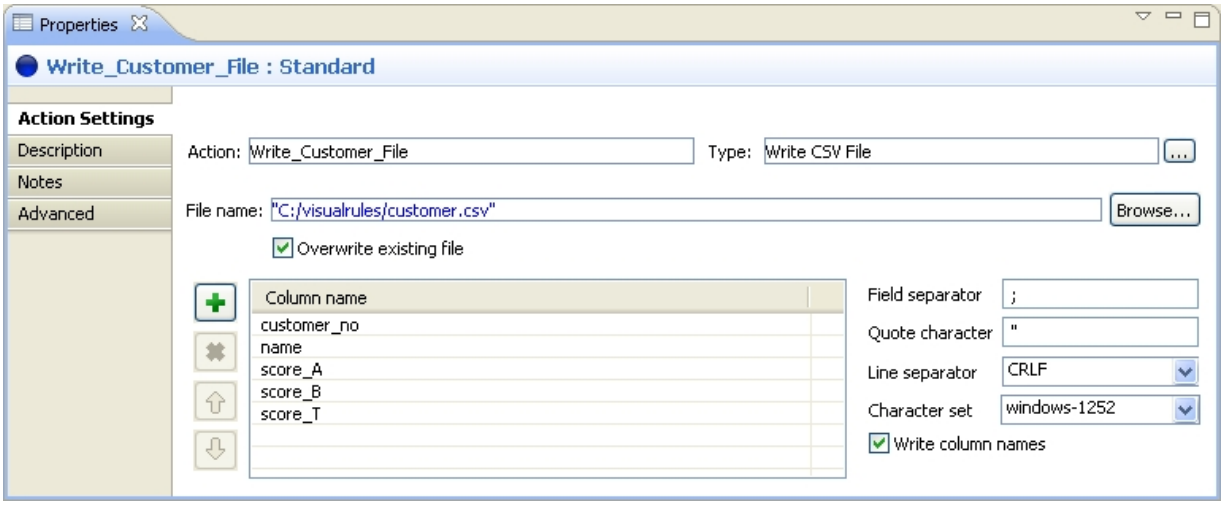


Figure 3.15. Action settings of a CSVWrite action

Related References.

- Section 5.6.7.3, “Output message Action Tabs” [250]
- Section 5.6.7.4, “Log message Action Tab” [251]
- Section 5.6.7.5, “Send e-mail Action Tabs” [252]
- Section 5.6.7.6, “Write CSV File Action Tabs” [253]

3.17. Action Type

The value of an action is set to `true` when it fires. This happens independently of the action type. However, additional things may happen depending on the type of the action. The action type of an action defines what exactly happens when the associated action is fired. Visual Rules has some built-in action types but can also be extended by any number of custom action types. See the Java Integration Guide for how to define custom action types.

The following action types are available by default:

Standard
: An action of type **Standard** does nothing else when fired. Actions of this type are used to represent logical results only.

Output message
: An action of type **Output message** prints a message to the screen (console) or to a file, depending on its settings.

Log message
: An action of type **Log message** prints a message to a logging system. This is useful for tracing or debugging purposes.

Send e-mail
: An action of type **Send e-mail** sends an email. Sender, recipient, subject and email body can be defined dynamically.

Write CSV file
: An action of type **Write CSV file** writes a record into a CSV file (comma separated values). This file can then e.g. be read by Excel or other applications.

Read CSV file
: An action of type **Read CSV file** reads records from a CSV file (comma separated values).

The **Read CSV file** action type is only available for rule models that have activated the **Visual Rules 3.x compatibility function/actions**. This can be done on the **Extensions** tab in the **Properties** of the rule model.

Related Concepts.

- Section 3.16, “Action” [79]

Related References.

- Section 5.6.7.3, “Output message Action Tabs” [250]
- Section 5.6.7.4, “Log message Action Tab” [251]
- Section 5.6.7.5, “Send e-mail Action Tabs” [252]
- Section 5.6.7.6, “Write CSV File Action Tabs” [253]

3.18. Function

Functions are used within expressions. There are many pre-defined functions available in Visual Rules that do computations, formatting and conversion of data and many things more. When you are editing an expression you can press **Ctrl**+**Space** to show the content assist which lists all available functions.

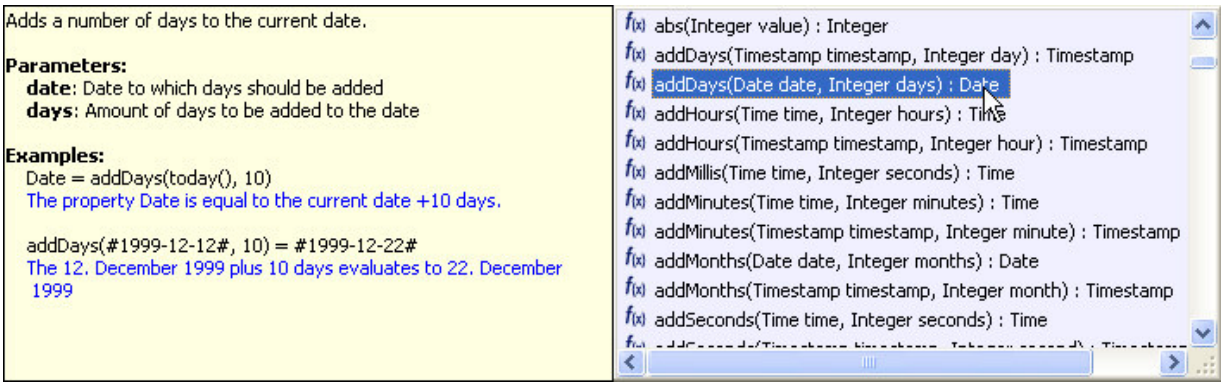

Adds a number of days to the current date.
Parameters:
date: Date to which days should be added
days: Amount of days to be added to the date
Examples:
Date = addDays(today(), 10)
The property Date is equal to the current date +10 days.
addDays(#1999-12-12#, 10) = #1999-12-22#
The 12. December 1999 plus 10 days evaluates to 22. December 1999
abs(Integer value) : Integer
addDays(Timestamp timestamp, Integer day) : Timestamp
addDays(Date date, Integer days) : Date
addHours(Time time, Integer hours) : Time
addHours(Timestamp timestamp, Integer hour) : Timestamp
addMillis(Time time, Integer seconds) : Time
addMinutes(Time time, Integer minutes) : Time
addMinutes(Timestamp timestamp, Integer minute) : Timestamp
addMonths(Date date, Integer months) : Date
addMonths(Timestamp timestamp, Integer month) : Timestamp
addSeconds(Time time, Integer seconds) : Time

Figure 3.16. Functions in the Content Asisst

A function can define zero, one or more parameters that need to be specified when the function is called. A function returns a result. All parameters and the result are of a specific data type. For example, the function `addDays` shown above has two parameters, a `Date` and an `Integer`. The result is a `Date`.

Visual Rules can be extended with user-defined functions.

Related Concepts.

- Section 3.12.7, “Calling Functions” [58]

3.19. Service

A service is some functionality external to Visual Rules. Services can be called by rules using the Call Service element, e.g. to fetch additional data or to trigger external processes. A rule can pass data to a service and read any results the service may produce. Therefore every service defines input and output parameters (and their types). A service is identified by its name.

Services are in a way similar to actions. However, actions can only have input parameters and don't return data, while services properly define both input *and* output data. As such, they much more resemble rules which also define input and output data. One way to think of services is as "external" rules.

Related Concepts.

- Section 3.5.6, “Call Service” [40]
- Section 3.20, “Service Type” [82]

3.20. Service Type

Every service has a service type. The service type is a technical definition that tells Visual Rules how a specific service call is to be executed and what technical parameters are required to do that. Visual Rules can be extended with custom service types. See the Java Integration Guide for more information.

Related Concepts.

- Section 3.19, “Service” [81]

3.21. Auto Creation

The Auto Creation dialog pops up whenever Visual Rules wants to automatically create new rule model elements. For example, if the user enters an expression and refers to data elements that don't exist, the Auto Creation dialog asks the user if these data elements should be automatically created.

If you enter the expression `customer.age > 18` and there is no data element `customer` defined yet, then Auto Creation will suggest to create an internal data element `customer` and a structure named `Customer` with an attribute `age`.

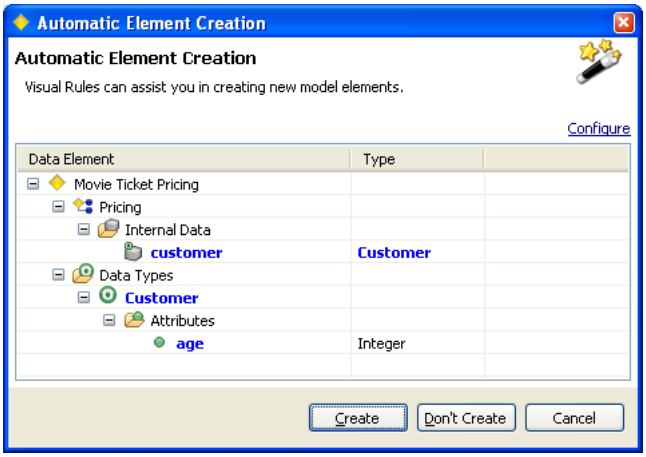


Figure 3.17. Auto Creation dialog

Auto Creation can not only create data and data types, but also rules, actions, action types and services. The behavior of Auto Creation can be configured individually for each of these element types. You can choose if the elements should be created always or never or if the user should be prompted.

Click on **Configure** to bring up the user preferences for Auto Creation or open it with **Window > Preferences ... > Visual Rules > Auto Creation** and set the elements that should be created automatically to **Prompt**.

Related Tasks.

- Section 4.10.3, “Working with Auto Creation” [159]

Related References.

- Section 5.4.3, “Auto Creation Dialog” [218]
- Section 5.7.3, “Auto Creation Preferences” [264]

3.22. Rule Testing

Rule testing is the process of ensuring the correctness and completeness of an individual rule or a set of rules. This is achieved by defining tests and test cases for the rules and then by executing these test cases in an automated way.

The following sections describe rule tests and the test editor that is used to define and execute the tests in VisualRules.

3.22.1. Rule Test

A rule test is a test for a specific rule. It tests the correctness of this rule by executing the rule with some input data, inspecting the results the rule has produced and by verifying that these results correspond with the expected results. One such execution is called a test case. A rule test can consist of any number of test cases. And there can be multiple tests for the same rule, too.

Rule tests are defined, edited and executed with the rule test editor. The flow rule and decision table editors list the tests of a rule on their **Rule Context** palettes.

Related Concepts.

- Section 3.22.2, “Rule Test Editor” [83]
- Section 3.6, “Flow Rule Editor” [45]
- Section 3.8, “Decision Table Editor” [50]
- Section 3.22.4, “Test Suite” [86]

3.22.2. Rule Test Editor

The rule test editor is used to define and edit rule tests.

It consists of two tabs named **Test Cases** and **Configuration**. The first tab shows the test description and on the left side there is a list of all the test cases. On the right side there are two sections that display the input and output data for each test case. The output data section also contains a column where expected results can be entered.

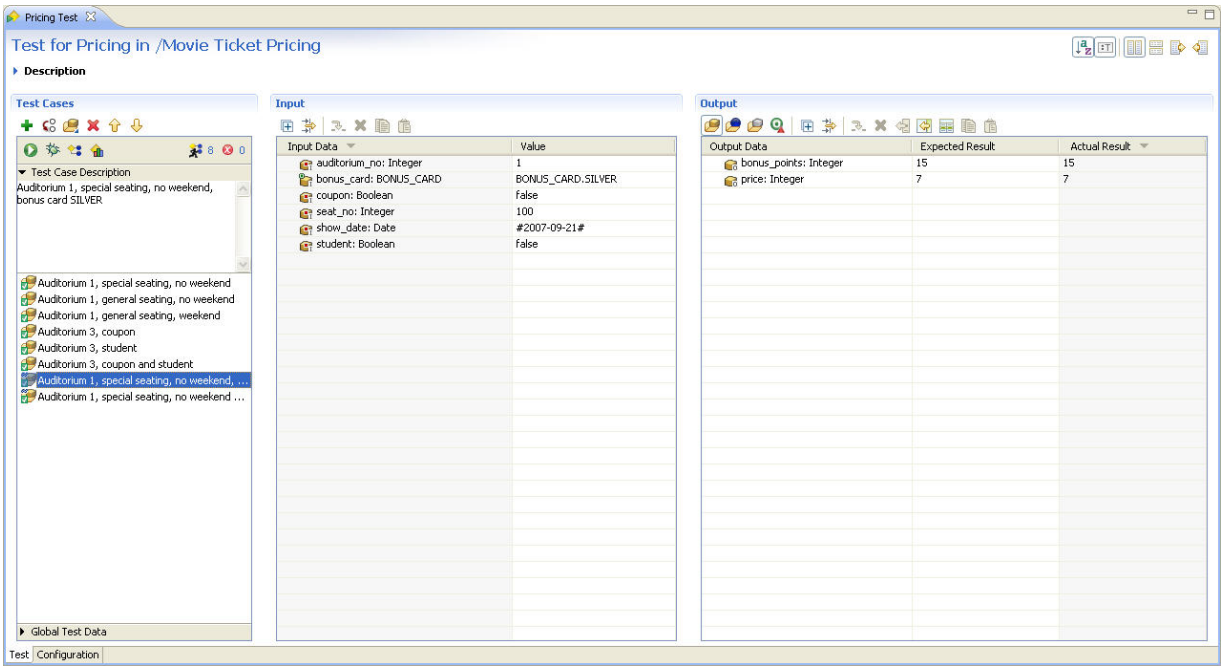


Figure 3.18. Rule Test Editor - Test Cases

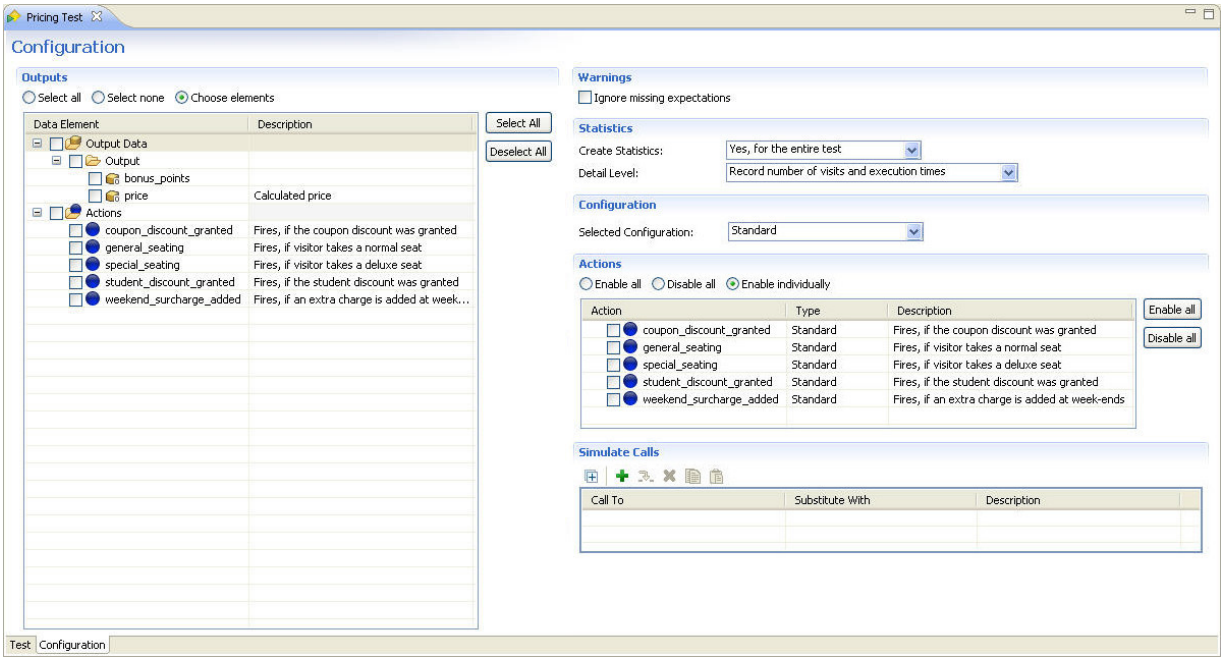


Figure 3.19. Rule Test Editor - Configuration

Related Concepts.

- Section 3.22.1, “Rule Test” [83]

Related Tasks.

- Section 4.11, “Testing Rules” [160]

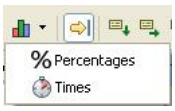
Related References.

- Section 5.3.4, “Rule Test Editor” [210]

3.22.3. Statistics

During rule execution Visual Rules can collect statistical and tracing information for later use. This is especially useful during testing and provides the user an insight into the workings of the rules.

The display of statistics is turned on by activating the Hide/Show Statistics button ( ) on the toolbar. The small arrow to the right opens a drop-down which allows you to specify what statistical information should be displayed.



An important part of the statistical information are the execution counters for each rule element. These indicate how often each rule element was executed. When statistics are activated, these counters are displayed next to each rule element, like shown below.

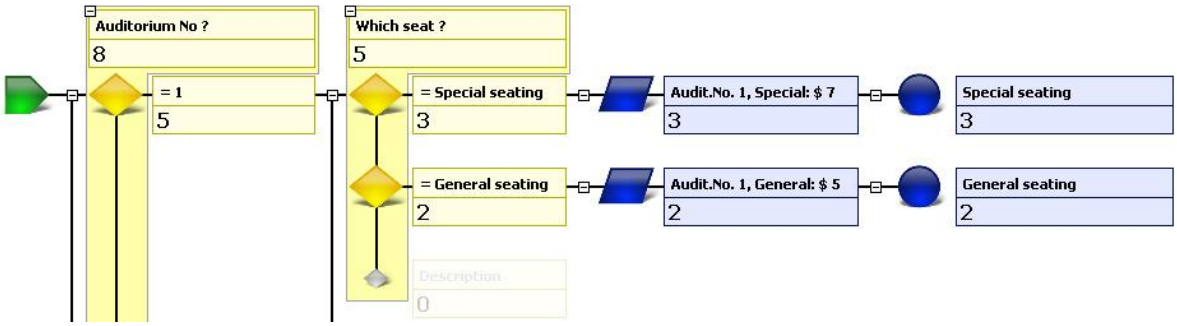


Figure 3.20. Display of statistics in the flow rule editor

Little barcharts are added when you activate the **Percentages** option from the statistics drop-down. The percentages specify how often each individual element was executed in relation to how often the whole rule was executed.

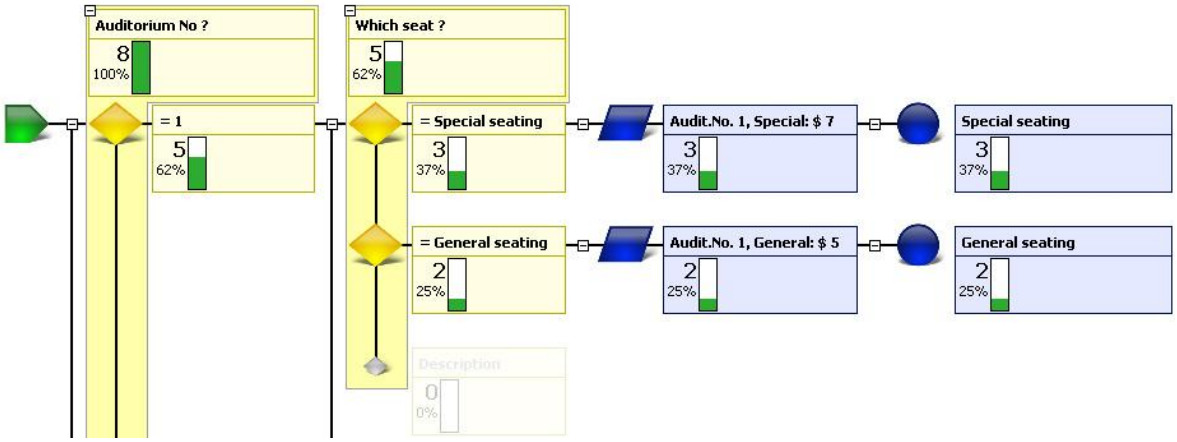


Figure 3.21. Display of statistics with percentages

You can also look at execution times by activating the Times option from the statistics drop-down. This will show execution times at each element. Please note that these times always specify how long it took to execute the whole branch. So times are added up from right to left.

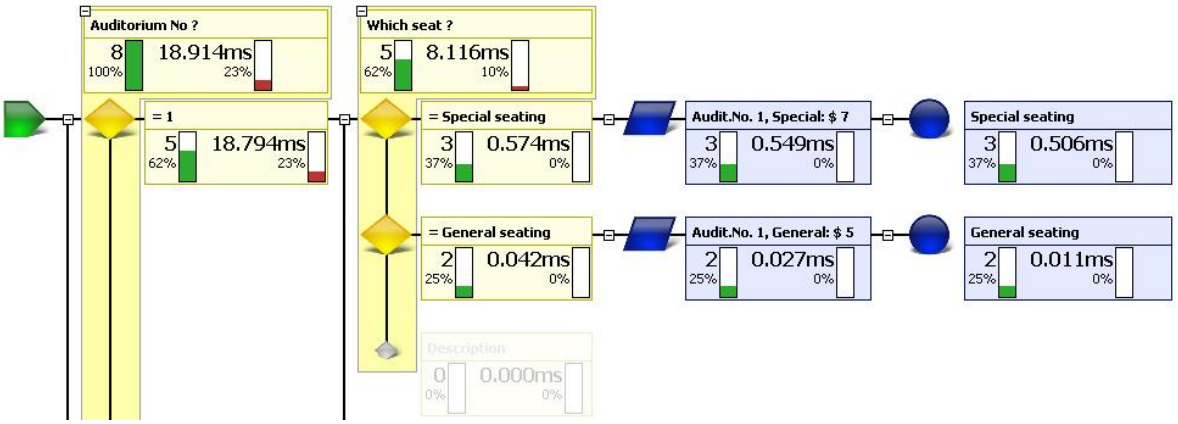


Figure 3.22. Display of statistics with percentages

Due to the nature of the Java virtual machine (JVM), individual execution times for the same rule may differ largely. Most specifically, the first call to a rule is usually way slower than the second by a magnitude of 1000 or more. This is because the JVM does additional things (incl. class loading) when it executes code for the first time. The JVM further optimizes code when it is executed repeatedly (HotSpot compiler), so the performance increases over time.

The precision of time measurements possible with a specific Java VM can also have a great effect. Most importantly, you should use a Java 1.5+ VM instead of a 1.4 VM because the 1.5+ API offers nanosecond resolution, while 1.4 offers only milliseconds.

So the displayed execution times during tests should not be used to estimate execution times during production.

3.22.4. Test Suite

A test suite is a collection of tests that can be executed together. A test suite can consist of any number of rule tests and nested test suites. When the test suite is executed, all test failures of contained rule tests are displayed.

Test suites are defined, edited and executed with the test suite editor.

Related Concepts.

- Section 3.22.5, “Test Suite Editor” [86]

3.22.5. Test Suite Editor

The test suite editor is used to define and edit test suites.

It shows the description of the test suite and displays all contained rule tests and nested test suites. Actions for executing the test suite and for opening the contained tests in their respective editor are available as well as a bar that shows the progress of the test suite execution and the overall success. Test failures are displayed in the table on the right side.

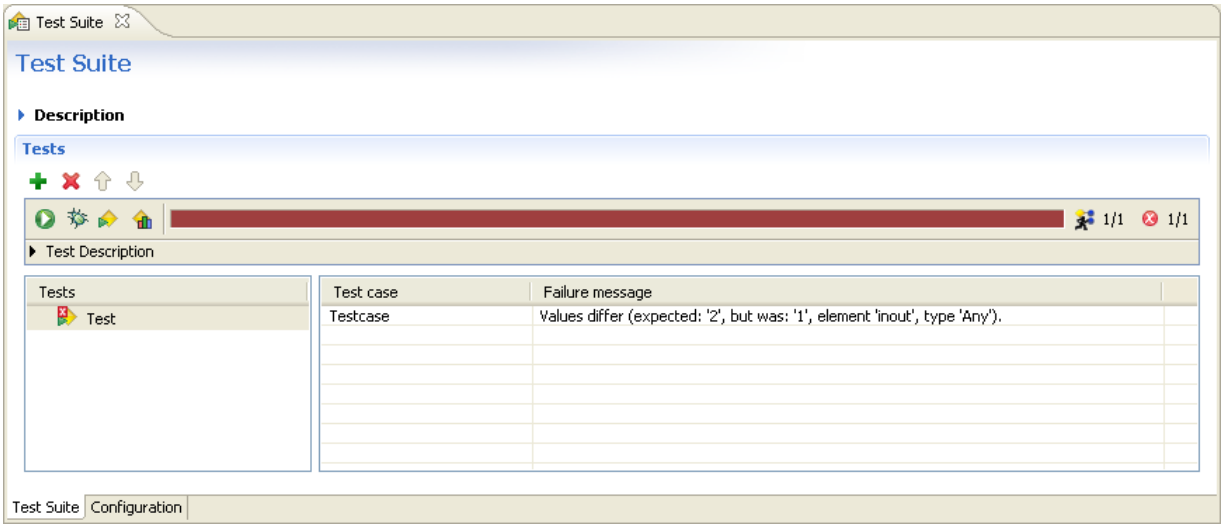


Figure 3.23. Test Suite Editor

Related Concepts.

- Section 3.22.4, “Test Suite” [86]
- Section 3.22.1, “Rule Test” [83]

Related Tasks.

- Section 4.11, “Testing Rules” [160]
- Section 4.12, “Organizing Rule Tests in Test Suites” [172]

Related References.

- Section 5.3.5, “Test Suite Editor” [213]

3.23. Rule Debugging

When new rules are created, they sometimes do not work as they should right away. They may produce unexpected results or seem to make the wrong decisions. In these situations it is important to have a means to more closely inspect what is going on during rule execution. This is what rule debugging is about. Rule debugging lets the user step through the rule execution one step at a time, halt at specific locations in the rules and to inspect the state of the data currently being processed.

3.23.1. Debugger

The debugger is a separate perspective built into Visual Rules Modeler. The perspective is named **Debug** and Visual Rules automatically switches to it when needed, e.g. when a breakpoint is reached. The debugger is used to manually step through rule execution, inspect the data being processed and by doing so, identify errors ("bugs") in the rules.

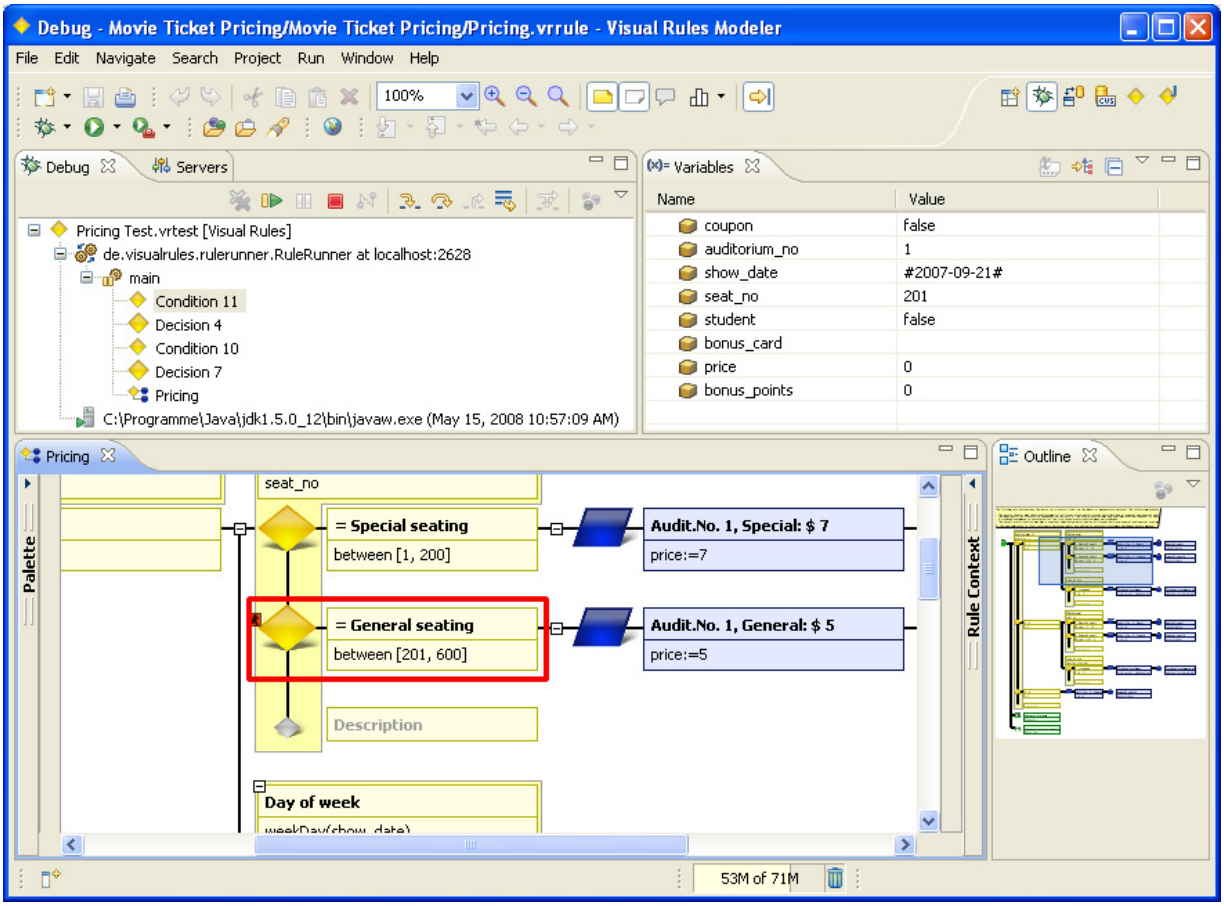


Figure 3.24. Debug perspective

The debugger can be used to debug rule tests or rules running inside a Java application (remote debugging).

Related Concepts.

- Section 3.22.1, “Rule Test” [83]
- Section 3.22.2, “Rule Test Editor” [83]

Related Tasks.

- Section 4.13.2, “Debugging a Rule Test” [175]

Related References.

- Section 5.5.8, “Debug View” [227]
- Section 5.5.9, “Variables View” [228]
- Section 5.5.10, “Breakpoints View” [229]

3.23.2. Breakpoint

A breakpoint represents a specific location in a rule model where execution should pause during a debug session. When rules are executed in the debugger and a breakpoint is reached, execution will halt and present the current position and currently processed data to the user for inspection.

Breakpoints can be set at every rule element in flow rules or in every (white) cell of decision tables. This can be done with the **Toggle Breakpoint** entry from the context menu.

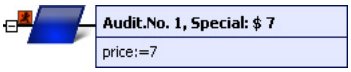


Figure 3.25. Breakpoint on a rule element

bonus_card	= BONUS_CARD.GOLD	= BONUS_CARD.SILVER
money_spent	bonus_points	bonus_points
< 6	20	10
< 8	35	15
>= 8	50	20

Figure 3.26. Breakpoint on a decision table cell

Breakpoints can be temporarily disabled with the **Disable Breakpoint** entry from the context menu. When a breakpoint is disabled, rule execution will not pause at that breakpoint.

The **Breakpoints** view lists all currently existing breakpoints.

Related Concepts.

- Section 3.23.1, “Debugger” [87]
- Section 3.6, “Flow Rule Editor” [45]
- Section 3.8, “Decision Table Editor” [50]

Related Tasks.

- Section 4.13.1, “Setting Breakpoints” [175]

Related References.

- Section 5.5.10, “Breakpoints View” [229]

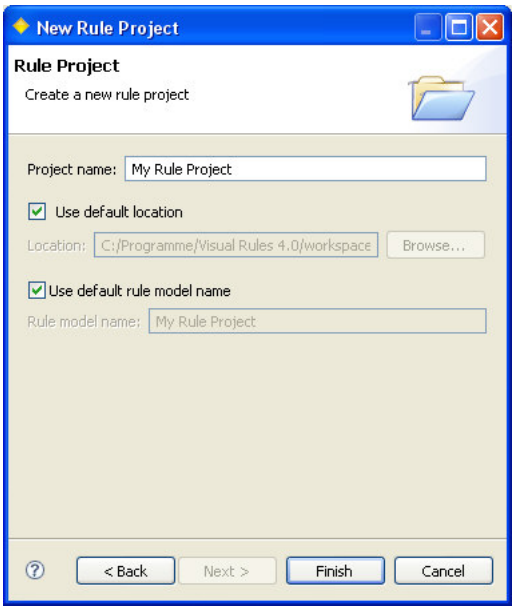
Chapter 4. Tasks

4.1. Working with Rule Projects

4.1.1. Creating a new Rule Project

1. Select the menu item **File > New**. Alternatively you can click on the arrow to the right of this icon ( ) on the toolbar.
2. Select the **Rule Project** entry from the list.

   If you are not in a Visual Rules perspective, you must select **Other...**, then select **Rule Project** from the list and press **Next >**
3. The **New Rule Project** wizard appears.



4. Enter a name for the rule project.
5. Press **Finish** to create the new rule project.

Related Concepts.

- Section 3.1, “Rule Project” [25]

Related References.

- Section 5.2.1, “New Rule Project Wizard” [200]

4.1.2. Setting Rule Project Identifiers (Group Id, Artifact Id, Version)

1. Open the rule project editor by double-clicking the `ruleproject.vr` file.
2. Change the **Group Id**, **Artifact Id** and **Version** fields in the **Project Information** section.
3. Click on the Save button ( ) in the toolbar. Alternatively you can press **Ctrl**+**S**.

Related Concepts.

- Section 3.1, “Rule Project” [25]

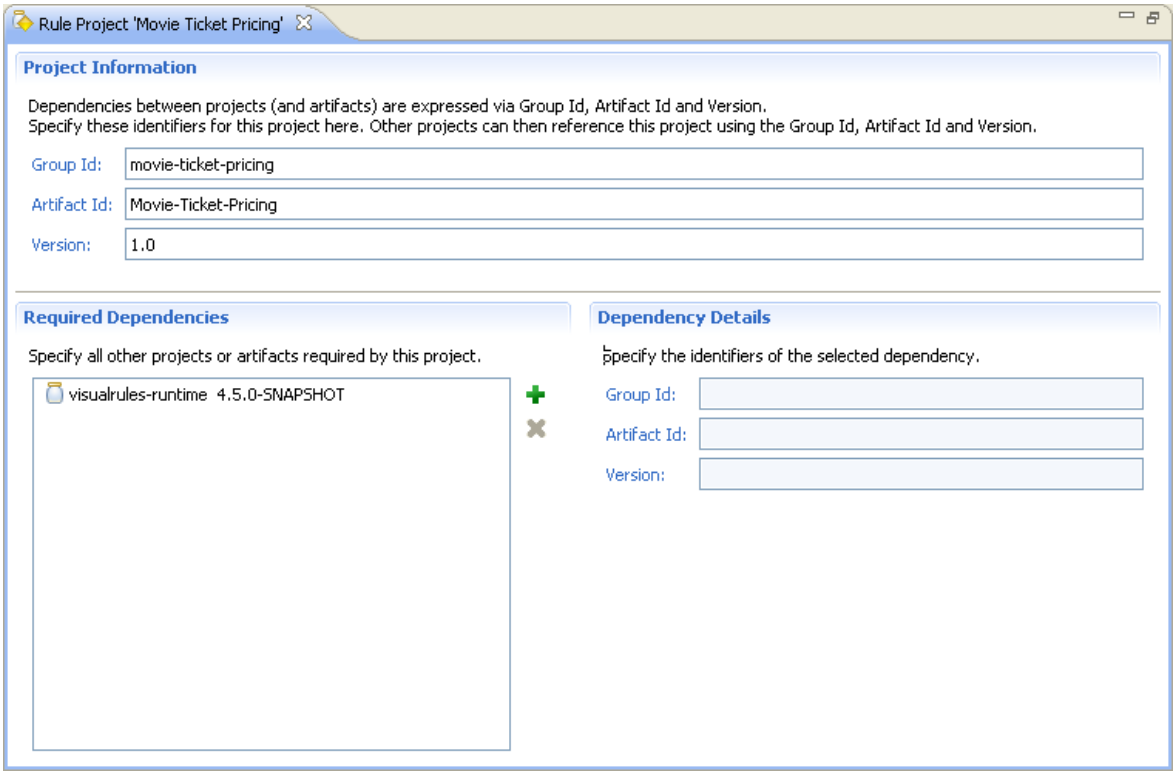
Related Tasks.

- Section 4.1.3, “Defining Rule Project Dependencies” [90]

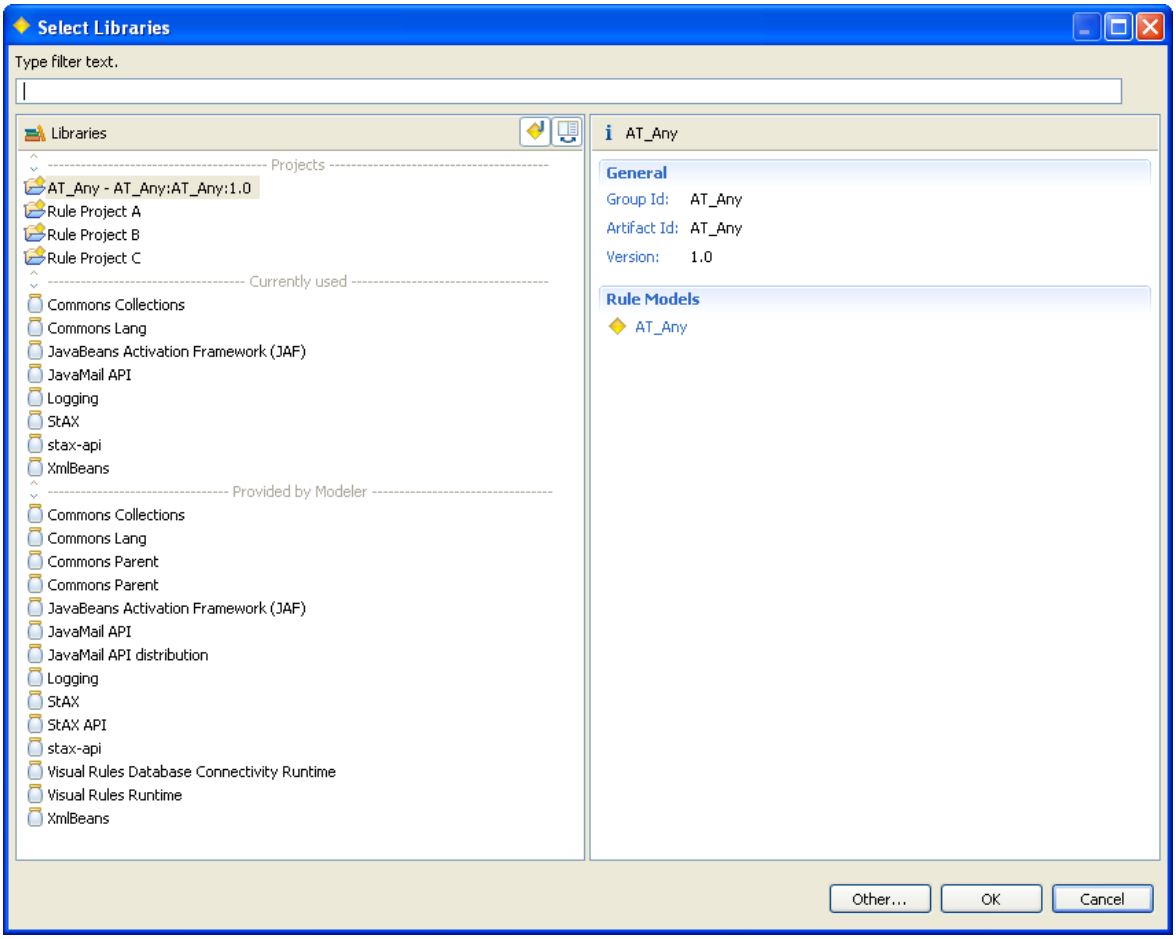
4.1.3. Defining Rule Project Dependencies

1. Open the rule project editor by double-clicking the `ruleproject.vr` file.
2. The **Required Dependencies** section lists all the dependencies of the rule project.

   Use the button to add a new dependency and the button to remove a dependency.

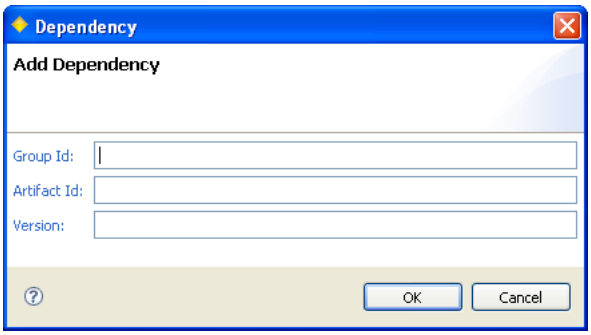

Rule Project 'Movie Ticket Pricing'
Project Information
Dependencies between projects (and artifacts) are expressed via Group Id, Artifact Id and Version.
Specify these identifiers for this project here. Other projects can then reference this project using the Group Id, Artifact Id and Version.
Group Id:
movie-ticket-pricing
Artifact Id:
Movie-Ticket-Pricing
Version:
1.0
Required Dependencies
Specify all other projects or artifacts required by this project.
visualrules-runtime 4.5.0-SNAPSHOT
Dependency Details
Specify the identifiers of the selected dependency.
Group Id:
Artifact Id:
Version:

3. When you add a dependency, the **Select Libraries** dialog lets you select rule projects and libraries from your workspace. Select a rule project or library and click **OK** to add it to the list of dependencies.



4. If you want to add a dependency to a library or rule artifact which is neither in your workspace nor in a Maven repository of the **Visual Rules Team Sever**that your rule project is connected to, click on **Other...**.

   In the **Dependency** dialog, specify the **Group Id**, **Artifact Id** and **Version** (e.g. `commons-math` / `commons-math` / `1.2`). Click **OK**.



5. Save the changes made to `ruleproject.vr`.

6. Visual Rules Modeler will now try to resolve the newly defined dependencies. If some dependencies cannot be resolved, you will see error markers at the `ruleproject.vr` file and in the rule project editor.

Related Concepts.

- Section 3.1, “Rule Project” [25]

Related Tasks.

- Section 4.1.2, “Setting Rule Project Identifiers (Group Id, Artifact Id, Version)” [89]

4.1.4. Analyzing Rule Projects

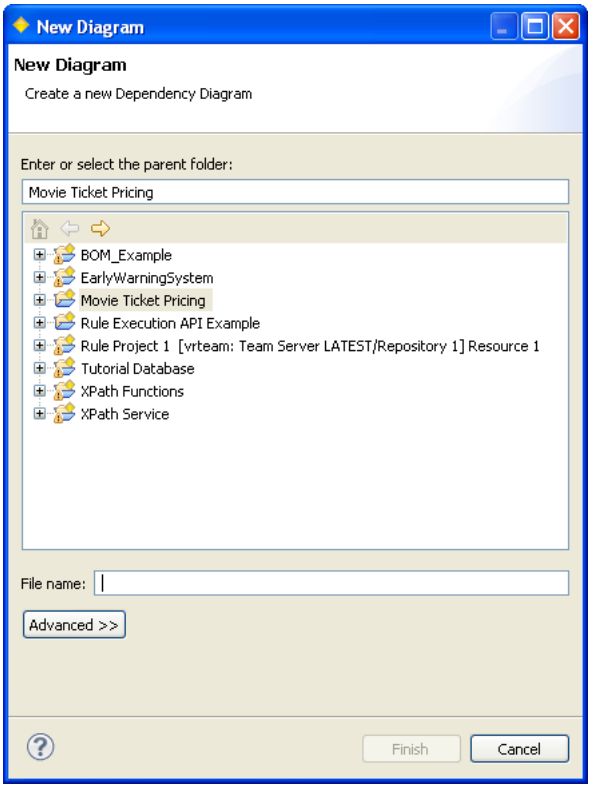
Large projects often contain lots of rules and rule packages. For a better understanding of the relationship and usage of the elements included, you have the following possibilities.

4.1.4.1. Visualizing Dependencies between the Elements within a Rule Project

Between the elements within a rule project there may be different kinds of dependencies like rule calls, rule package reuses, etc. These dependencies can be visualized in a dependency diagram.

To create a dependency diagram, do the following:

1. In the **Rule Explorer** or **Project Explorer**, right-click on a rule project to open the contextual menu and select **New > Dependency Diagram** ( ). The dialog **New Diagram** appears:



2. Select a location in the workspace for the dependency diagram and enter a name.

3. Press **Finish**. An empty diagram is created and it is added at the respective location in the **Rule Explorer**/ **Project Explorer** with the symbol . The diagram is automatically shown in the **Dependency Diagram Editor**.

4. To show the dependencies within a rule project, move the rule project (or the relevant elements) into the diagram from the **Rule Explorer**/ **Project Explorer** per drag&drop.

To show an existing dependency diagram, do the following:

1. In the **Rule Explorer** or **Project Explorer**, double-click on the respective symbol .

2. The dependency diagram is shown in the **Dependency Diagram Editor**.

Related References.

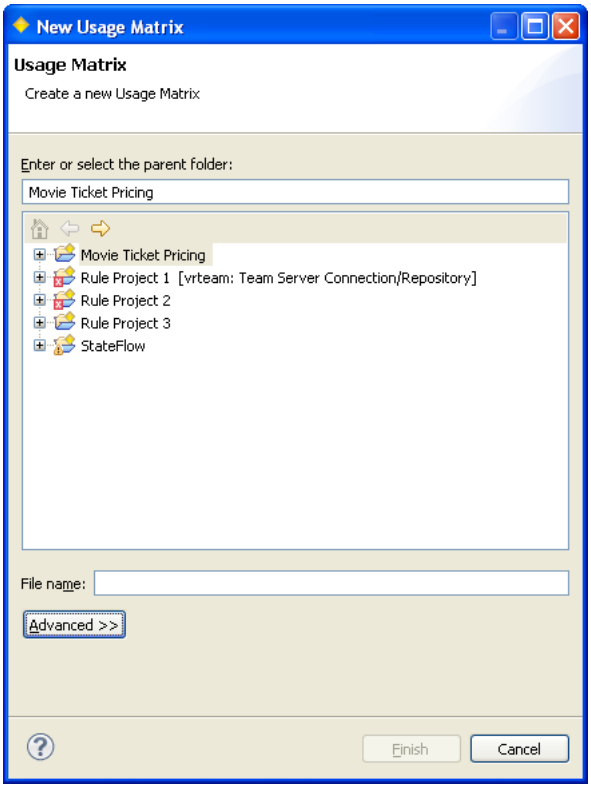
- Section 5.3.7, “Dependency Diagram Editor” [215]

4.1.4.2. Visualizing the Usage of Elements within a Rule Project

Each of the data elements, actions, etc. may be used in different contexts within a rule project, i.e. in different flow rules, decision tables or stateflows. Which element is actually used in which context and how often it is used there, can be visualized in a usage matrix.

To create a usage matrix, do the following:

1. In the **Rule Explorer** or **Project Explorer**, right-click on a rule project to open the contextual menu and select **New > Usage Matrix** ( ). The dialog **New Usage Matrix** appears:



2. Select a location in the workspace for the usage matrix and enter a name.
3. Press **Finish**. A usage matrix is created and added in the **Rule Explorer/ Project Explorer** with the icon . The matrix is automatically shown in the **Usage Matrix Editor**.

To show an existing usage matrix, do the following:

1. In the **Rule Explorer** or **Project Explorer**, double-click on the respective icon .
2. The usage matrix is shown in the **Usage Matrix Editor**.

Related References.

- Section 5.3.8, “Usage Matrix Editor” [216]

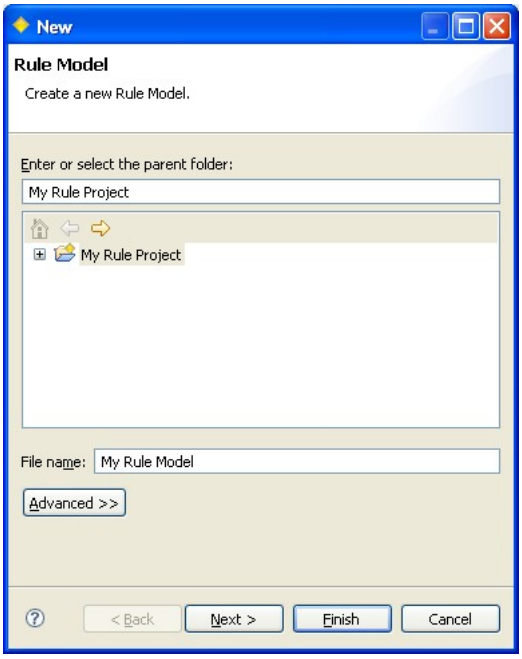
4.2. Working with Rule Models

The following sections contain step-by-step procedures for different tasks you may want to perform with rule models, e.g. create new rules or rule packages.

4.2.1. Creating a new Rule Model

1. Right-click on the rule project or a subfolder thereof in the **Rule Explorer** or **Project Explorer**.
2. Select the item **New > Rule Model** from the context menu.

3. The **New Rule Model** wizard appears.



4. Specify the location and the name for the new rule model.

5. Press **Finish** to create the new rule model.

Related Concepts.

- Section 3.2, “Rule Model” [25]

Related References.

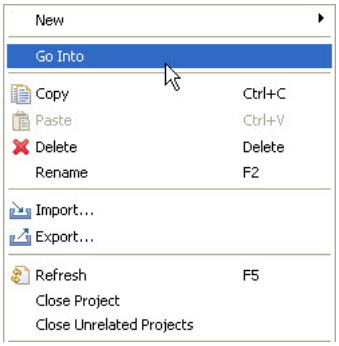
- Section 5.2.2, “New Rule Model Wizard” [201]

4.2.2. Opening a Rule Model

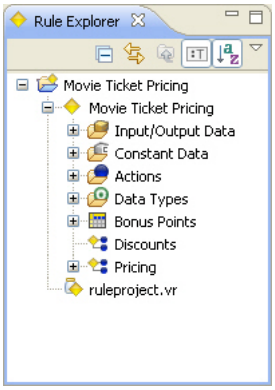
1. Double-click on the rule model in the **Rule Explorer** to open it.

   Alternatively you can right-click on the rule model and select **Open** from the context menu.

   With the **Go Into** menu entry available in the context menu of **Rule Explorer**, you can navigate into the tree-like structure of projects, rule models and rule packages. Whenever you do that, the **Rule Explorer** contents are limited to only that branch. A button in the toolbar ( ) lets you go up again one level.



2. When the rule model is open, the **Rule Explorer** displays the model contents as children of the rule model.



Related Concepts.

- Section 3.2, “Rule Model” [25]

Related References.

- Section 5.5.2, “Project Explorer View” [223]

4.2.3. Saving Changes in Rule Models

Whenever a rule model or a part of a rule model is changed, these changes need to be saved at some point. The **Rule Explorer** indicates unsaved changes by an asterisk in front of the changed element and all the elements higher up in the rule package hierarchy.

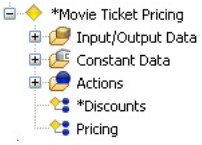


Figure 4.1. Unsaved changes in a rule model

1. Select an element with unsaved changes in the **Rule Explorer**. The Save button ( ) in the toolbar will activate.
2. Click on the Save button ( ) in the toolbar. Alternatively you can press **Ctrl**+**S** or use the **File > Save** menu item.
3. The changes will be saved and the asterisk(s) will disappear.

Visual Rules always saves all changes made in the selected element and in any element further down in the package hierarchy. So if you save a rule package, it will also save all changes made in sub packages or rules contained therein. So, in order to save all changes in a rule model, simply select the rule model and save.

If you want to save all changes in all rule models, you can press **Ctrl**+**Shift**+**S** or use the **File > Save All** menu item.

Related References.

- Section 5.5.2, “Project Explorer View” [223]

4.2.4. Creating a new Rule Package

1. Right-click on a rule model or on a rule package in the **Rule Explorer** where you want to create the new rule package. A context menu will appear.
2. Select the **New Element > Rule Package** entry from the context menu.

3. The **New Rule Package** dialog opens. Enter the name of the package you want to create. This name must be different from any other rule package or rule on the same level.

4. Press **OK** to create the rule package.

Related Concepts.

- Section 3.2, “Rule Model” [25]
- Section 3.3, “Rule Package” [26]

Related References.

- Section 5.5.2, “Project Explorer View” [223]

4.2.5. Deleting a Rule Package

1. To delete a rule package, right-click on the rule package you wish to delete and select **Delete** from the context menu. Alternatively, press the **Del** key.

2. Visual Rules will ask whether you are sure you want to delete the rule package. Click on **Yes**.

3. The rule package and all its contents are deleted.

Related Concepts.

- Section 3.2, “Rule Model” [25]
- Section 3.3, “Rule Package” [26]

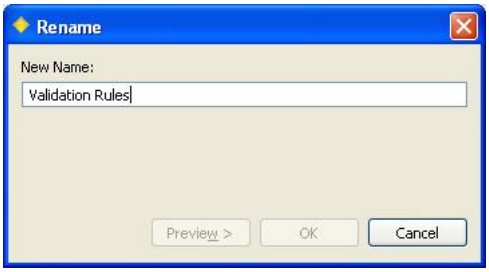
Related References.

- Section 5.5.2, “Project Explorer View” [223]

4.2.6. Renaming a Rule Package

1. To rename a rule package, right-click on the rule package you wish to rename and select **Rename** from the context menu. Alternatively, press the **F2** key.

2. A dialog will open where you can enter the new name. You must enter a name that is different from any other rule package or rule on the same level.



3. Click on **Preview >** to get a list of all the upcoming changes that the rename will cause (You can also uncheck only some of the changes that you don't want to make, while leaving others checked). Click on **Cancel** if you don't want to make the changes.

4. Click on **OK** to perform the rename.

Related Concepts.

- Section 3.3, “Rule Package” [26]

Related References.

- Section 5.5.2, “Project Explorer View” [223]

4.2.7. Moving a Rule Package

1. Moving a rule package from one rule model or rule package into another rule model or rule package is done with drag&drop. Select the rule package you want to move, click it and hold down the left mouse button.
2. Drag the rule package to the location you want to move it to.
3. Let go of the mouse button to move the rule package and its contents.

If you want to create a copy of the rule package, press and hold the **Ctrl** key when you release the mouse button.

Moving a rule package will also move the corresponding files and folders on the file system from one folder into another. Depending on the version control system you are using, this may require additional steps when the updated rule model is delivered to the version control system.

There are also known restrictions with some version control systems (e.g. Subversion) that allow folders to be moved just once between checkins. In that case it may be helpful to commit the changes immediately after the rule package was moved, and only then continue modeling.

4.2.8. Creating a new Flow Rule

1. Right-click on the rule model, where you want to create the new flow rule, in the **Rule Explorer** or **Project Explorer**.
2. Select **New Element > Flow Rule** from the context menu.
3. The **New Flow Rule** wizard appears.
4. Select the rule model and rule package where the new rule should be created. You can click on the corresponding **Browse** buttons to select the rule model and rule package from a list.

If a rule model or rule package was selected when the wizard was started, then the rule model and rule package settings will already contain correct values. So the easiest way to create a new rule is to select the rule package where the new rule should be created and then start the **New Flow Rule** wizard.

You can also right-click on a rule model or rule package and select **New Element > Flow Rule** from the context menu. That's the quickest way to create new rules.

5. Enter a name for the rule.
6. If you want to use a rule template as the basis for the new flow rule, check the **Use template** box and select the desired rule template by clicking on the **Browse** button. Alternatively you can use the code assistant by pressing **Ctrl**+**Space**.
7. Press **Finish** to create the new flow rule. The flow rule editor will open automatically.

Related Concepts.

- Section 3.4, “Flow Rule” [29]
- Section 3.3, “Rule Package” [26]
- Section 3.2, “Rule Model” [25]
- Section 3.4.1, “Flow Rule Template” [30]

Related References.

- Section 5.2.3, “New Rule Wizard” [201]
- Section 5.5.2, “Project Explorer View” [223]

4.2.9. Deleting a Rule

1. To delete a rule, right-click on the rule you wish to delete and select **Delete** from the context menu. Alternatively, press the **Del** key.
2. Visual Rules will ask whether you are sure you want to delete the rule. Click on **Yes**.
3. The rule is deleted.

When you delete a rule and save this change, you may see errors in other rules that have previously used the rule that was deleted.

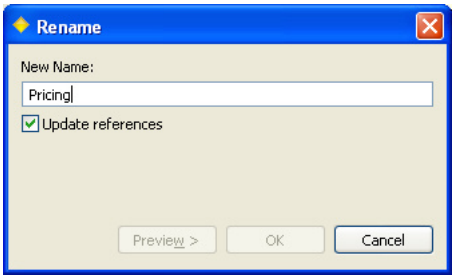
If you want to know up front whether there are other rules using the rule that you want to delete, right-click on the rule and select the **Search References** menu entry in the context menu. The **Search** view will open and list all the rules that will be impacted by the deletion.

Related Concepts.

- Section 3.4, “Flow Rule” [29]

4.2.10. Renaming a Rule

1. To rename a rule, right-click on the rule you wish to rename and select **Rename** from the context menu. Alternatively, press the **F2** key.
2. A dialog will open where you can enter the new name. You must enter a name that is different from any other rule or rule package on the same level.



3. Leave the checkbox **Update References** checked. Otherwise all references to the rule will not be updated to reflect the new name.
4. Click on **Preview >** to get a list of all the upcoming changes that the rename will cause (You can also uncheck only some of the changes that you don't want to make, while leaving others checked). Click on **Cancel** if you don't want to make the changes.
5. Click on **OK** to perform the rename.

Related Concepts.

- Section 3.4, “Flow Rule” [29]

4.2.11. Finding a Rule

1. Open the **Open Rule** dialog by selecting the **Navigate > Open Rule** menu entry, clicking on the Open Rule toolbar item ( ) or by pressing **Ctrl**+**Alt**+**R**.
2. A dialog will open that contains a list of all rules in all rule models in the workspace.
3. Enter the beginning of the name of the rule you want to open. This will filter the list so that it only shows rules with matching names. If nothing is entered, the list will show all rules. You can use asterisks * or question marks ? as wildcard characters.
4. Select a rule in the list and press **OK** to open that rule in the rule editor. Alternatively you can double-click an entry in the list.

Instead of using the **Open Rule** dialog, you could also use the search capabilities of Visual Rules to search for specific rules in your rule models.

Related Concepts.

- Section 3.4, “Flow Rule” [29]

Related Tasks.

- Section 4.14, “Searching Rule Models” [178]

Related References.

- Section 5.4.1, “Open Rule Dialog” [216]

4.2.12. Copying a Rule

1. Copying a rule is done with drag&drop. Select the rule you want to copy, click on it and hold down the left mouse button.
2. Drag the rule to the location you want to copy it to. Press and hold the **Ctrl** key to create a copy.
3. Let go of the mouse button to paste the copy.

If the **Ctrl** key is not held down when you release the mouse button, the rule is not copied to the new location, but moved.

Related Concepts.

- Section 3.4, “Flow Rule” [29]

Related Tasks.

- Section 4.2.13, “Moving a Rule” [99]

4.2.13. Moving a Rule

1. Moving a rule from one rule package into another rule package is done with drag&drop. Select the rule you want to move, click it and hold down the left mouse button.
2. Drag the rule to the location you want to move it to.
3. Let go of the mouse button to move the rule.

If you want to create a copy of the rule, press and hold the **Ctrl** key when you release the mouse button.

Related Concepts.

- Section 3.4, “Flow Rule” [29]

Related Tasks.

- Section 4.2.12, “Copying a Rule” [99]

4.2.14. Creating a new State Flow

1. Right-click on the rule model, where you want to create the new state flow, in the **Rule Explorer** or **Project Explorer**.
2. Select **New Element > State Flow** from the context menu.

3. The **New State Flow** wizard appears.
4. Select the rule model and rule package where the new state flow should be created. You can click on the corresponding **Browse** buttons to select the rule model and rule package from a list.

If a rule model or rule package was selected when the wizard was started, then the rule model and rule package settings will already contain correct values. So the easiest way to create a new state flow is to select the rule package where the new state flow should be created and then start the **New State Flow** wizard.

You can also right-click on a rule model or rule package and select **New Element > Sate Flow** from the context menu. That's the quickest way to create new state flows.

5. Enter a name for the state flow.
6. Press **Finish** to create the new state flow. The state flow editor will open automatically.

Related Concepts.

- Section 3.9, “State Flow” [52]
- Section 3.3, “Rule Package” [26]
- Section 3.2, “Rule Model” [25]

Related References.

- Section 5.2.4, “New State Flow Wizard” [202]
- Section 5.5.2, “Project Explorer View” [223]

4.2.15. Deleting a State Flow

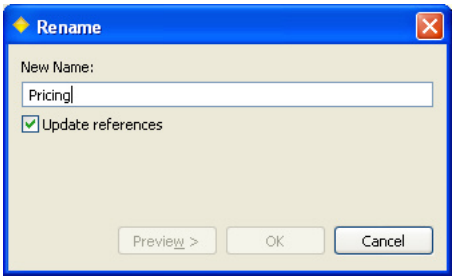
1. To delete a state flow, right-click on the flow rule you wish to delete and select **Delete** from the context menu. Alternatively, press the **Del** key.
2. Visual Rules will ask whether you are sure you want to delete the state flow. Click on **Yes**.
3. The state flow is deleted.

Related Concepts.

- Section 3.9, “State Flow” [52]

4.2.16. Renaming a State Flow

1. To rename a state flow, right-click on the state flow you wish to rename and select **Rename** from the context menu. Alternatively, press the **F2** key.
2. A dialog will open where you can enter the new name. You must enter a name that is different from any other state flow or rule package on the same level.



The checkbox **Update References** is here irrelevant.

3. Click on **OK** to perform the rename.

Related Concepts.

- Section 3.9, “State Flow” [52]

4.2.17. Copying a State Flow

1. Copying a state flow is done with drag&drop. Select the state flow you want to copy, click on it and hold down the left mouse button.
2. Drag the rule to the location you want to copy it to. Press and hold the **Ctrl** key to create a copy.
3. Let go of the mouse button to paste the copy.

If the **Ctrl** key is not held down when you release the mouse button, the state flow is not copied to the new location, but moved.

Related Concepts.

- Section 3.9, “State Flow” [52]

Related Tasks.

- Section 4.2.18, “Moving a State Flow” [101]

4.2.18. Moving a State Flow

1. Moving a state flow from one rule package into another rule package is done with drag&drop. Select the state flow you want to move, click it and hold down the left mouse button.
2. Drag the state flow to the location you want to move it to.
3. Let go of the mouse button to move the state flow.

If you want to create a copy of the state flow, press and hold the **Ctrl** key when you release the mouse button.

Related Concepts.

- Section 3.9, “State Flow” [52]

Related Tasks.

- Section 4.2.17, “Copying a State Flow” [101]

4.2.19. Reusing Rule Packages

You have the following possibilities to reuse rule packages:

- Section 4.2.19.1, “Manually selecting Rule Packages to be reused” [102]
- Section 4.2.19.2, “Executing an automatic Organization of Package Reuse (on Package Level)” [102]
- Section 4.2.19.3, “Executing an automatic Organization of Package Reuse (on Rule Level)” [102]

In specific cases an automatic organization of package reuse on package level is not possible. If so, a corresponding message appears.

Related Concepts.

- Section 3.3.1, “Rule Package Reuse” [28]

Related References.

- Section 5.6.5.1, “Reuse Packages Tab” [241]

4.2.19.1. Manually selecting Rule Packages to be reused

If you want to manually select the rule packages to be reused, do the following:

1. Select the rule package in the **Rule Explorer** that should reuse other rule packages.
2. In the **Properties** view activate the **Reuse Packages** tab.
3. Press the button to add one or more packages to the list of reused packages.
4. A dialog will appear that shows all rule models in the workspace and their rule packages. If you miss a rule model, then the rule project containing the currently selected rule package does not declare a dependency to this rule package's rule project. In order to declare such a dependency, follow the instructions given in Section 4.1.3, “Defining Rule Project Dependencies” [90].
5. Activate the checkboxes in front of all the rule packages (or rule models) that you want to reuse. Click **OK**.
6. The rule packages are added to the list of reused rule packages.
7. Save the change.

If you no longer want to reuse a rule package, do the following:

1. Do steps 1 and 2 like specified above.
2. Select an entry in the list and press the button to remove a package from the list of reused packages.
3. Save the change.

4.2.19.2. Executing an automatic Organization of Package Reuse (on Package Level)

If you want to execute an automatic organization of package reuse on package level, do the following:

1. Right-click on the rule package in the **Rule Explorer** that should reuse other rule packages.
2. In the context menu select **Organize Package Reuses**.
3. All required rule packages are now reused by the relevant rule package.
4. Save the change.

4.2.19.3. Executing an automatic Organization of Package Reuse (on Rule Level)

If you want to execute an automatic organization of package reuse on rule level, do the following:

1. Double-click on the flow rule or decision table that requires an element from other rule packages.
2. Right-click anywhere in the **Flow Rule Editor** or **Decision Table Editor**, respectively.
3. In the context menu select **Organize Package Reuses**.
4. All required rule packages are reused by the rule package including the relevant flow rule or decision table.

If any of the elements required in the relevant rule or decision table is available in different rule packages, then a dialog appears, that allows you to select the rule package to be actually reused.

5. Save the change.

4.2.20. Editing Descriptions

You can enter descriptions for rule models, rule packages and rules.

1. In the **Rule Explorer** select the rule model, rule package or rule that you want to add a description to.
2. In the **Properties** view activate the **Description** tab.
3. Enter the description.

You can also specify hyperlinks to external documents within descriptions. These are automatically underlined if the protocol (e.g. **http://, resource://** or **file://**) is specified, marking them as links. Clicking on a link opens the associated application, displaying its contents.

Related Concepts.

- Section 3.15, “Description and Note” [78]

4.2.21. Editing Notes

You can enter notes for rule models, rule packages and rules.

1. In the **Rule Explorer** select a rule model, rule package or rule that you want to add the note to.
2. In the **Properties** view activate the **Notes** tab.
3. Click on the button to add a new note or click on the corresponding button to remove a note.
4. Enter the text of the note.

You can also specify hyperlinks to external documents within notes. These are automatically underlined if the protocol (e.g. **http://, resource://** or **file://**) is specified, marking them as links. Clicking on a link opens the associated application, displaying its contents.

Related Concepts.

- Section 3.15, “Description and Note” [78]

4.2.22. Undoing Changes

All changes to rule models can be undone.

1. Activate the **Rule Explorer** and select the **Edit > Undo** menu item. Alternatively, you can also use the **Ctrl**+**Z** key combination.

   You can repeat this several times to undo previous changes.
2. If you want to redo a change that was undone, select the **Edit > Redo** menu item. Alternatively, use the **Ctrl**+**Y** key combination.

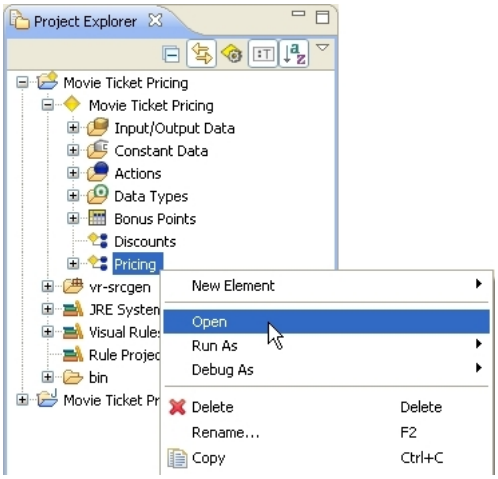
4.3. Working with Flow Rules

The following sections include detailed descriptions for working with flow rules and the flow rule editor.

4.3.1. Opening the Flow Rule Editor

- In the **Rule Explorer** double-click on a flow rule ( ) to open the flow rule editor.

Alternatively, you can right-click on the flow rule and select **Open**.



You can also open the **Flow Rule Editor** for a flow rule that is referenced in a call flow rule element. To do so, press the **Ctrl** key and click on the relevant reference in the **Flow Rule Editor**.

Related Concepts.

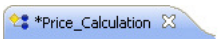
- Section 3.6, “Flow Rule Editor” [45]
- Section 3.4, “Flow Rule” [29]

Related References.

- Section 5.5.2, “Project Explorer View” [223]

4.3.2. Saving Changes

1. When you do any changes to a flow rule, the tab of the flow rule editor will show an asterisk right in front of the flow rule name.

2. To save the changes made in the current editor, press the **Save** button ( ) on the toolbar. This button is only enabled when changes were made.

   Alternatively you can press **Ctrl**+**S** or select the **File > Save** menu item.

   If you want to save all unsaved changes and not just the changes made in the current editor, you can press **Ctrl**+**Shift**+**S** or select the **File > Save All** menu item.

Related Concepts.

- Section 3.6, “Flow Rule Editor” [45]

Related References.

- Section 5.5.2, “Project Explorer View” [223]

4.3.3. Navigating in the Flow Rule Editor

4.3.3.1. Keyboard Navigation

- Use the arrow keys (up, down, left, right) to navigate from one rule element to the other.

- Press **Alt+Cursor down** and **Alt+Cursor up** to enter and navigate inside a rule element.
- Press **F2** or simply start typing to start inplace editing.

4.3.3.2. Scrolling

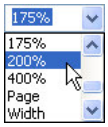
There are several ways to navigate a larger flow rule within the flow rule editor.

- Click and hold the middle mouse button. Moving the mouse while holding the middle mouse button will move the flow rule within the flow rule editor.
- Use the scrollbars to the right and at the bottom of the flow rule editor window.
- Click on a specific part of the flow rule in the **Outline** view to scroll to that location. You can also hold the left mouse button and move the mouse within the **Outline** view.
- Use the arrow keys on your keyboard to navigate from one rule element to another.
- When dragging & dropping rule elements, you can hold still near the border of the flow rule editor. Shortly thereafter the flow rule editor will start scrolling into that direction. This way you can drag&drop between parts of the flow rule that are not visible at the same time.

4.3.3.3. Zooming

There are several ways to zoom in and out of a rule in the flow rule editor.

- Use the zoom toolbar buttons , , and to zoom in, zoom out and reset the zoom to 100%.
- Use the zoom drop-down on the toolbar.



- Press and hold the **Ctrl** key and use the mouse wheel to zoom in and out.

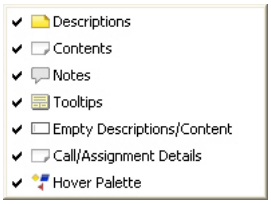
4.3.3.4. Collapsing/Expanding Branches

A branch of a flow rule can be collapsed or expanded either by

- clicking on the ⊞ or ⊟ boxes behind every rule element
- by pressing the **Space** key

4.3.4. Configuring the Appearance and Capabilities of the Flow Rule Editor

You can configure the appearance as well as the capabilities of the flow rule editor via the **View** ( ) dropdown toolbar button.



Alternatively, you can also right-click in the flow rule editor and select the according entries from the **View** context menu. The following table shows the individual options.

Table 4.1. Individual options for configuring the appearance and capabilities of the flow rule editor

Option	Description
Descriptions	Show/hide descriptions of rule elements
Contents	Show/hide contents of rule elements
Notes	Show/hide notes of rule elements
Tooltips	Show/hide tooltips for rule elements
Empty Descriptions/Content	Show/hide empty descriptions or content of rule elements
Call/Assignment Details	Show/hide details for call and assignment elements
Hover Palette	Enable/disable hover palette

You can also modify the maximum height and width of rule elements. This can be done via the increase and decrease buttons in the toolbar ( ). These settings are also available in the **Preferences** (Visual Rules > Flow Rule Editor).

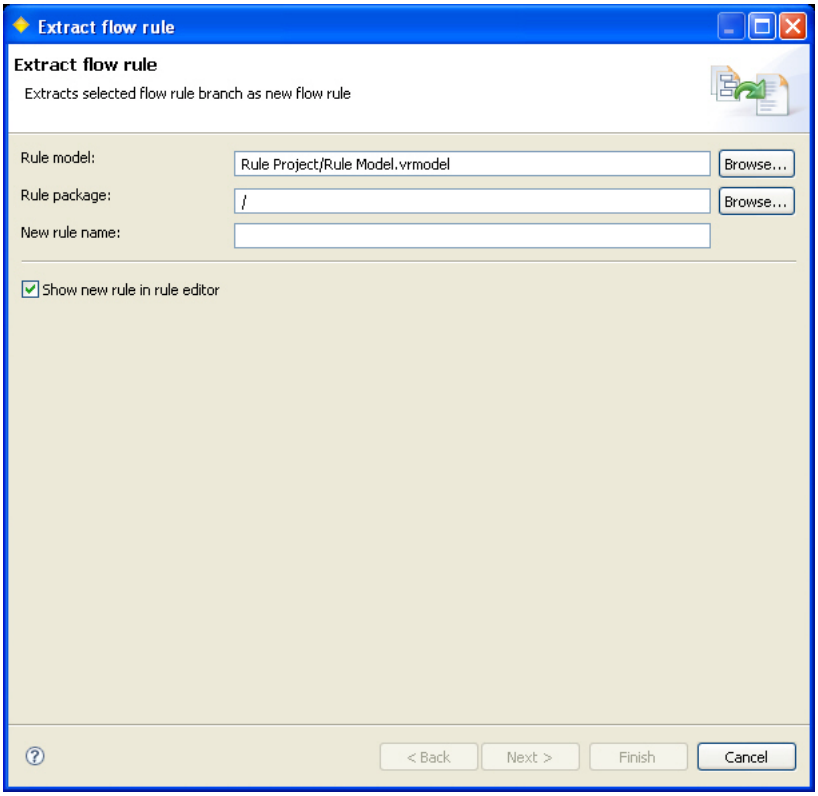
If your rule elements are rather small already (don't contain large descriptions), they may be far away from the maximum width and height settings and you may need to click the red decrease buttons several times in order to see an effect.

4.3.5. Extracting a branch of a Flow Rule as a new Flow Rule

You can extract a branch of a flow rule as a new flow rule. Instead of executing the respective branch the original flow rule will call the newly created flow rule, such that the overall behavior remains unchanged. This way you can split a large flow rule into pieces.

The new flow rule is automatically added all necessary elements like data elements, actions, etc.. Only if the new flow rule is placed in a different rule project, the file ruleproject.vr might need to be adapted.

1. Right-click on the first element of the branch. A context menu will appear.
2. Select the **Extract Branch as New Flow Rule** entry from the context menu.
3. The **Extract Flow Rule** wizard appears.



4. Select the rule model and rule package where the new flow rule should be located. You can click on the corresponding **Browse...** buttons to select the rule model and rule package from a list.
5. Enter a name for the new flow rule.
6. Click on **Next >** to get a list of all the upcoming changes that the extraction will cause (You can also uncheck only some of the changes that you don't want to make, while leaving others checked). Click on **Cancel** if you don't want to make the changes.
7. Press **Finish** to create the new flow rule. Unless you deactivated the corresponding checkbox, the flow rule editor will automatically show the new flow rule.

Related Concepts.

- Section 3.4, “Flow Rule” [29]
- Section 3.3, “Rule Package” [26]
- Section 3.2, “Rule Model” [25]
- Section 3.4.1, “Flow Rule Template” [30]

Related References.

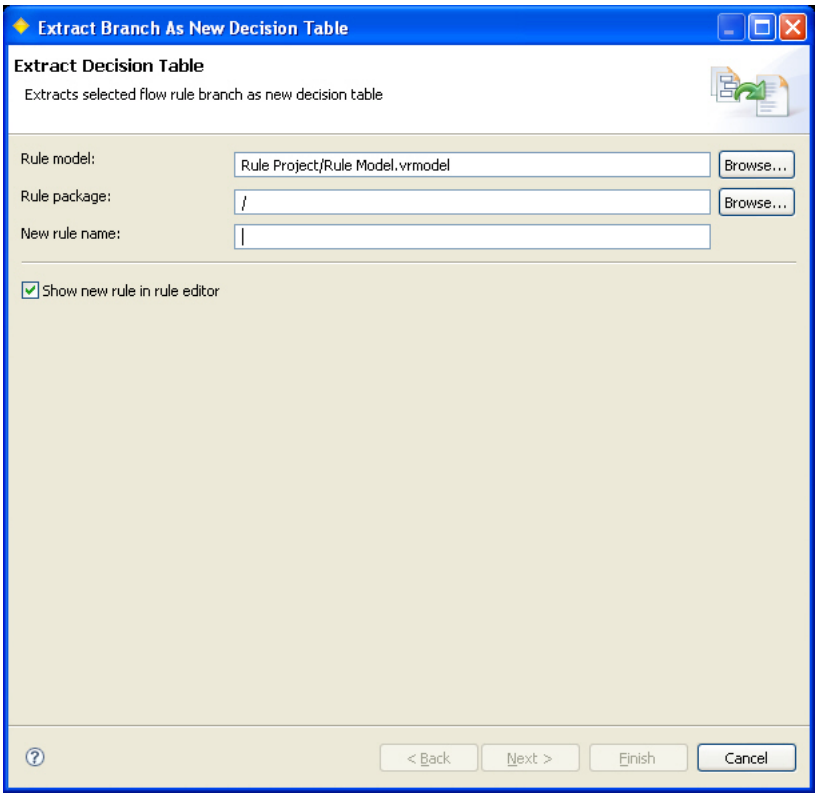
- Section 5.2.3, “New Rule Wizard” [201]
- Section 5.5.2, “Project Explorer View” [223]

4.3.6. Extracting a branch of a Flow Rule as a new Decision Table

You can extract a branch of a flow rule as a new decision table. Instead of executing the respective branch the original flow rule will call the newly created decision table, such that the overall behavior remains unchanged. This way you can split a large flow rule into pieces.

The new decision table is automatically added all necessary elements like data elements, actions, etc.. Only if the new decision table is placed in a different rule project, the file ruleproject.vr might need to be adapted.

1. Right-click on the first element of the branch. A context menu will appear.
2. Select the **Extract Branch as New Decision Table** entry from the context menu.
3. The **Extract Decision Table** wizard appears.



4. Select the rule model and rule package where the new decision table should be located. You can click on the corresponding **Browse...** buttons to select the rule model and rule package from a list.
5. Enter a name for the new decision table.
6. Click on **Next >** to get a list of all the upcoming changes that the extraction will cause (You can also uncheck only some of the changes that you don't want to make, while leaving others checked). Click on **Cancel** if you don't want to make the changes.
7. Press **Finish** to create the new decision table. Unless you deactivated the corresponding checkbox, the decision table editor will automatically show the new decision table.

Related Concepts.

- Section 3.4, “Flow Rule” [29]
- Section 3.3, “Rule Package” [26]
- Section 3.2, “Rule Model” [25]
- Section 3.4.1, “Flow Rule Template” [30]

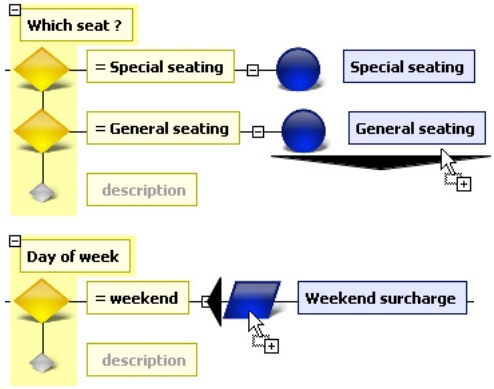
Related References.

- Section 5.2.3, “New Rule Wizard” [201]
- Section 5.5.2, “Project Explorer View” [223]

4.3.7. Adding New Flow Rule Elements

1. Select a rule element in the palette by clicking on it.

2. Now, move the mouse over an existing element in the flow rule. A black arrow will appear to show you where the new element will be added. This can be either before, after, above or below an existing rule element. Accordingly, the black arrow will point to the left, to the right, up or down. Move the mouse until the arrow points into the direction you want.



   A stop (⃠) icon indicates that the rule element cannot be added at this location.

3. When you see a black arrow, click again and the new rule element will be inserted.

Related Concepts.

- Section 3.5, “Flow Rule Element” [31]
- Section 3.6, “Flow Rule Editor” [45]

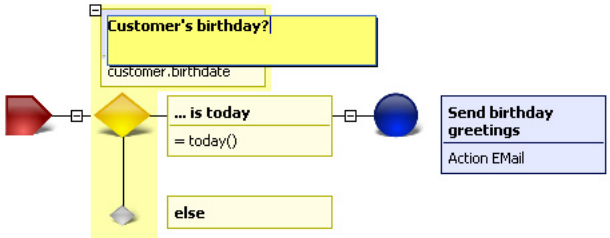
Related References.

- Section 5.3.1.1, “Flow Rule Editor Palette” [205]

4.3.8. Editing Descriptions of Flow Rule Elements

Next to each flow rule element is a box that contains the description and/or content (rule expressions).

1. Make sure descriptions are displayed by activating the Hide/Show Descriptions ( ) toolbar button.
2. Double-click a description you want to edit. You can also just select it and start typing. The inplace editor will open.



3. Enter the description.
4. Press **Ctrl**+**Enter** to close the editor or click with the mouse outside of the editor.

Related Concepts.

- Section 3.5, “Flow Rule Element” [31]
- Section 3.15, “Description and Note” [78]

4.3.9. Collapsing Branches

Individual branches of a flow rule can be collapsed and expanded to get a better overview. This is often helpful when working with very large flow rules.

1. To collapse individual branches of a flow rule, click on the minus sign (⊟) next to a rule element. A collapsed branch is represented by a grey rectangle.
2. Click on the plus sign (⊞) in front of the grey rectangle to expand the branch again. You can also press the **Space** key to expand and collapse branches.

⊟

Expanding and collapsing branches is for visual purposes only. The rule is not changed in any way.

Related Concepts.

- Section 3.5.12, “Branch Description” [44]

4.3.10. Editing a Decision Element

A decision consists of one or more conditions, an else exit and an optional condition prefix. All parts can have their own descriptions. The following sections describe how to add, remove and edit the different parts of a decision element.

Related Concepts.

- Section 3.5.1, “Decision” [33]
- Section 3.12, “Expressions” [55]

Related Tasks.

- Section 4.10.1, “Using the Code Assist” [157]

Related References.

- Section 5.6.2.1, “Decision Overview Tab” [230]
- Section 5.6.2.2, “Decision Details Tab” [231]
- Section 5.6.1.1, “Description Tab” [229]

4.3.10.1. Editing a Decision Condition

In the flow rule editor, do the following:

1. Double-click on the description or expression of a condition. This will open the inplace editor.
2. Enter the description or expression for the condition. Use **Alt**+**Enter** to start a new line.
3. Press **Enter** to close the editor or click with the mouse outside of the editor.

In the **Properties** on the **Decision Overview** tab, do the following:

1. Double-click in either the description or the condition column to open an inplace editor.
2. Enter the description or expression for the condition. Use **Alt**+**Enter** to start a new line.
3. Press **Enter** to close the editor or click with the mouse outside of the editor.

In the **Properties** on the **Decision Details** tab, do the following:

1. Select the condition that you want to edit. To the right you see the description and the expression of the selected condition.
2. Edit the description or expression.

4.3.10.2. Adding a Condition to a Decision

In the flow rule editor, do the following:

1. Select the **Decide** element on the palette.
2. Move the mouse over the decision where you want to add another condition. A black arrow appears pointing up or down to indicate where the new condition will be inserted.
3. Click again. The condition is inserted.

In the **Properties** on the **Decision Overview** or **Decision Details** tabs, do the following:

1. Select the condition in the list where you want to insert the new condition.
2. Click on the button to insert the new condition.

4.3.10.3. Deleting a Condition from a Decision

In the flow rule editor, do the following:

1. Select the condition you want to remove.
2. Right-click and select **Delete** from the context menu. Alternatively, press the **Del** key.

In the **Properties** on the **Decision Overview** or **Decision Details** tabs, do the following:

1. Select the condition in the list that you want to remove.
2. Click on the button to delete the condition. If the delete function is disabled either no condition is selected or there is only one condition remaining in the decision. It cannot be removed because the decision must have at least one.

4.3.10.4. Reordering Conditions in a Decision

The conditions within one decision are processed in order from top to bottom. To change this order, you can move conditions up or down using drag&drop:

1. Click on the condition you want to move and keep the left mouse button pressed.
2. Move the condition up or down to where you want it. A black arrow indicates where it will be moved to.
3. Let go of the mouse button and the condition is moved (or copied if you hold the **Ctrl** key).

4.3.10.5. Editing the Common Condition Prefix

If all conditions start with the same prefix, you can specify this as the condition prefix.

In the flow rule editor, do the following:

1. Double-click on the condition prefix of the decision. This is the expression displayed above the first condition. An inplace editor will open.
2. Enter the expression to be used as the common condition prefix. Use **Alt**+**Enter** to start a new line.
3. Press **Enter** to close the editor or click with the mouse outside of the editor.

In the **Properties** on the **Decision Overview** tab, do the following:

1. Double-click in the condition column in the first row (the decision) to open an inplace editor.
2. Enter the expression to be used as the common condition prefix. Use **Alt**+**Enter** to start a new line.
3. Press **Enter** to close the editor or click with the mouse outside of the editor.

In the **Properties** on the **Decision Details** tab, do the following:

1. Select the first row (the decision). To the right you see the common condition prefix.
2. Enter the expression to be used as the common condition prefix.

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4.3.11. Editing an Assignment Element

An assignment element can contain one or more individual assignments. The following sections describe how to add, remove, sort and edit assignments in an assignment element.

Related Concepts.

- Section 3.5.2, “Assignments” [35]
- Section 3.12, “Expressions” [55]

Related Tasks.

- Section 4.10.1, “Using the Code Assist” [157]

Related References.

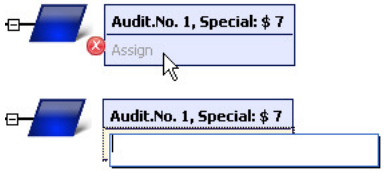
- Section 5.6.2.3, “Assignments Tab” [232]

4.3.11.1. Editing an Assignment

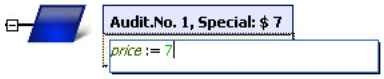
For each assignment within an assignment element you must specify a left side, an operation and a right side (except for the CLEAR assignment which only has a left side).

In the flow rule editor, do the following:

1. Make sure the contents are displayed by activating the Hide/Show Contents ( ) toolbar button.
2. Double-click the assignment to open an inplace editor.



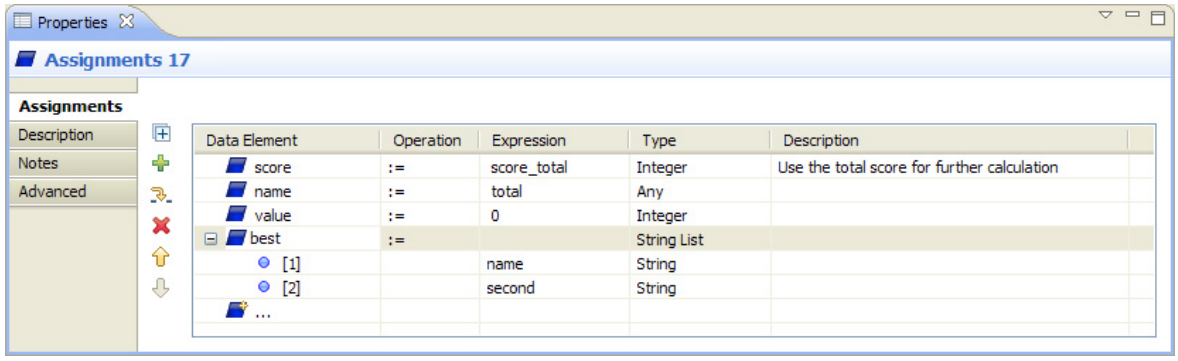
3. Enter the assignment expression. This includes the left side, the operation and the right side, all in one. The operator can be either `:=`, `ADD`, `REMOVE` or `CLEAR`. See Section 3.5.2, “Assignments” [35] for a description of the different operators of assignments. Use **Alt**+**Enter** to start a new line.



4. Press **Enter** to close the editor or click with the mouse outside of the editor.

In the **Properties** on the **Assignments** tab, do the following:

1. Double-click the left side of the assignment you want to edit. This will open an inplace editor.



2. Enter the data element that you want to assign to. This can be just the name of a data element but also a more complex expression, e.g. `customer.address[3].city`.
3. Press **Enter** to close the inplace editor or click with the mouse outside of the inplace editor.

4. If you want to change the default operation (:=) of the assignment, double-click it and choose the new operation from the drop-down list.
5. Double-click the right side of the assignment. This will open an inplace editor.
6. Enter the expression you want to use for the right side.
7. Optionally you can also enter a description for the assignment.

If the left side is a collection which can hold multiple elements or a structure with multiple attributes, there are alternative ways for entering the right side works. See below on how to enter the elements of a collection or how to specify values for the attributes of a structure.

If the left side is a structure, you can either specify an expression for the right side just like described above, or specify values for the individual attributes of the structure. In order to do that, do the following:

1. Expand the structure by clicking the plus (⊞) button in front of the left side. This will expand the list and show the structure's attributes on individual lines.
2. Enter right sides for some or all of the attributes. If attributes are themselves structures, they can also be expanded.

If the left side is a collection (or list or set) which can hold multiple values, you can create and specify the collection elements individually. In order to do that, do the following:

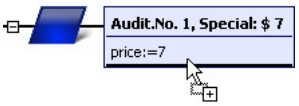
1. Select the collection.
2. Click on the button ( ) to add a new list element.

   The new list element is added and shown indented underneath the collection. The element is indicated by a number (index) in square brackets.
3. Optionally double-click the index and change it to another value.
4. Enter the right side for the element.

4.3.11.2. Adding an Assignment to an Assignment Element

In the flow rule editor, do the following:

1. Make sure the contents are displayed by activating the Hide/Show Contents ( ) toolbar button.
2. Select the **Assign** element on the palette.
3. Move the mouse over the list of assignments shown next to the assignment element where you want to add the new assignment. A black bar will appear to indicate where the assignment is inserted.



4. Click again. The assignment is inserted.

   Alternatively, you can simply use the **Insert** key and start typing, to substitute an Assignment in an Assignment Element.

In the **Properties** on the **Assignments** tab, do the following:

- Click on the button to insert a new assignment at the end of the list.

  Alternatively, you can simply start editing the last entry in the list, indicated by this icon ... . This will create a new assignment automatically.

4.3.11.3. Deleting an Assignment from an Assignment Element

In the flow rule editor, do the following:

1. Select the assignment that you want to delete.
2. Right-click on the assignment and select the **Delete** menu entry. Alternatively, press the **Del** key.

In the **Properties** on the **Assignments** tab, do the following:

1. In the list select the assignment you want to delete.
2. Click on the button to delete it.

4.3.11.4. Reordering the Assignments in an Assignment Element

If you want to reorder the assignments in your assignment element you do this by either:

1. Selecting the particular assignment in your assignment element and use the and buttons in the **Properties** on the **Assignments** tab,

   OR
2. Use the drag & drop functionality of the flow rule editor by selecting an assignment in the particular assignment element and drag it to the correct position in the assignment list.

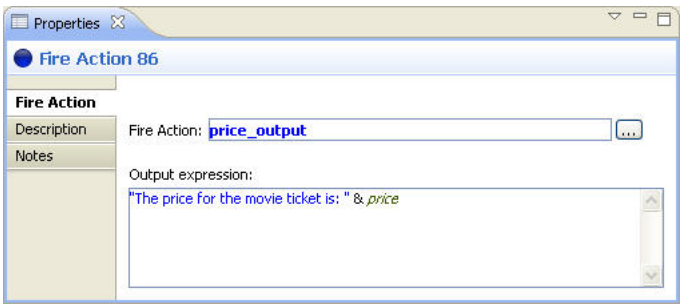
4.3.12. Editing a Fire Action Element

Different settings for an fire action element may be necessary, depending on the action type of the action.

In the **Properties** of the fire action element on the **Fire Action** tab, do the following:

1. In the **Fire Action** field specify the action that should be fired. Press **Ctrl**+**Space** for content assist or click on **...** to choose the action from a list of available actions.
2. If you leave the Fire Action field, the view changes and the action specific settings appear.
3. Insert the action specific settings. These settings apply only to the selected Fire Action element and are used when the action is fired at this location in the rule.

For example, these are the **Properties** of a Fire Action element that fires the action **price_output** of action type **Output message**.



Related Concepts.

- Section 3.5.3, “Fire Action” [37]
- Section 3.16, “Action” [79]

Related Tasks.

- Section 4.8.1, “Defining Actions” [154]

Related References.

- Section 5.6.7.3, “Output message Action Tabs” [250]

- Section 5.6.7.4, “Log message Action Tab” [251]
- Section 5.6.7.5, “Send e-mail Action Tabs” [252]
- Section 5.6.7.6, “Write CSV File Action Tabs” [253]

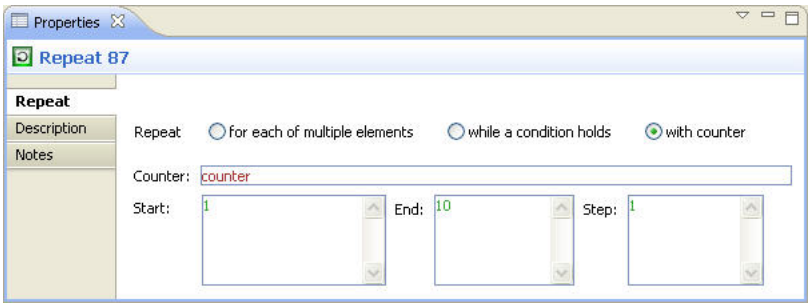
4.3.13. Editing a Repeat Element

Different settings for a repeat element may be necessary, depending on the type of repeat .

In the **Properties** of the repeat element on the **Repeat** tab, do the following:

1. Select the type of repeat you want to use in the repeat element. You can choose between **for each of multiple elements**, **while a condition holds** and **with counter**.
2. After the selection of a repeat type the view changes and the repeat type specific settings appear.
3. Insert the repeat type specific settings.

For example, the properties of a repeat element from repeat type **Repeat with counter**.



Related Concepts.

- Section 3.5.8, “Repeat” [40]
- Section 3.14.7, “Collection” [76]
- Section 3.12, “Expressions” [55]

Related Tasks.

- Section 4.10.1, “Using the Code Assist” [157]

Related References.

- Section 5.6.2.8, “Repeat Tab” [237]

4.3.14. Editing an End Repeat Element

The end repeat element has no specific element settings.

You have the possibility to insert a description and a note to describe what happens if this element is reached.

If the end repeat element is reached the nearest repeat element will be ended.

Related Concepts.

- Section 3.5.9, “End Repeat” [42]

Related Tasks.

- Section 4.3.13, “Editing a Repeat Element” [115]

4.3.15. Editing a Call Flow Rule Element

In order to edit a Call Flow Rule element open its **Properties** and select the **Call Flow Rule** tab and do the following:

1. Select in the field **Call Flow Rule** the rule that should be called. You can call rules from the same package or from any package that is defined to be reused.

   Press **Ctrl**+**Space** for content assist or click on **...** to choose the rule from a list of available rules.

2. The required input data elements of the called rule are displayed in the **Input Data** area. You have to specify values for at least the required inputs.

   Click on to automatically insert data elements as input values, when they have matching name and type. Only inputs still without a value will be affected.

3. The output data elements of the called rule are displayed in the **Output Data** area. Assign the output values to data elements of the calling flow rule.

   Click on to automatically insert data elements with matching names and types to assign the outputs to. Only outputs not yet assigned will be affected.

The button opens the specified flow rule in the flow rule editor.

Related Concepts.

- Section 3.5.4, “Call Flow Rule” [38]
- Section 3.4, “Flow Rule” [29]

Related Tasks.

- Section 4.10.1, “Using the Code Assist” [157]
- Section 4.11.9, “Copying and pasting values” [164]

Related References.

- Section 5.6.2.5, “Call Flow Rule” [234]

4.3.16. Editing a Call Decision Table Element

In order to edit a Call Decision element open its **Properties** and select the **Call Decision Table** tab and do the following:

1. Select in the field **Call Decision Table** the decision table that should be called. You can call decision tables from the same package or from any package that is defined to be reused.

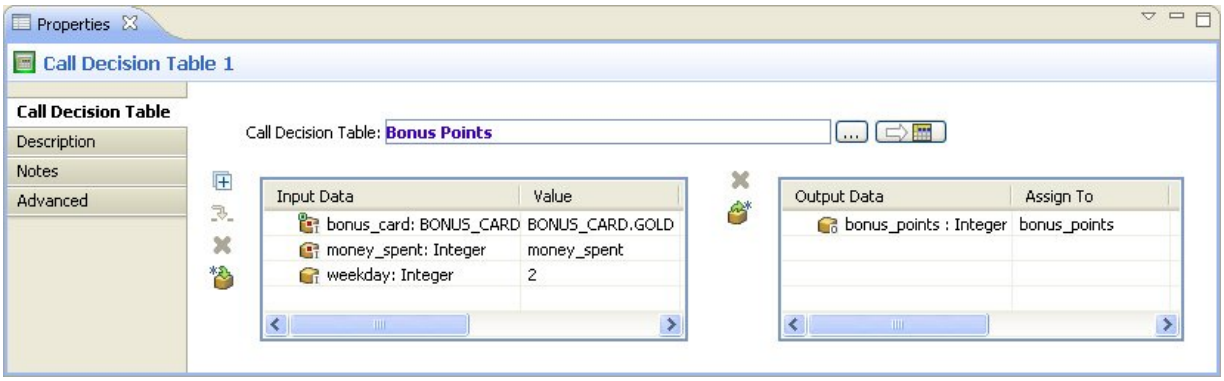
   Press **Ctrl**+**Space** for content assist or click on **...** to choose the decision table from a list of available decision tables.

2. The required input data elements of the called decision table are displayed in the **Input Data** area. You have to specify values for at least the required inputs.

Click on to automatically insert data elements as input values, when they have matching name and type. Only inputs still without a value will be affected.

3. The output data elements of the called decision table are displayed in the **Output Data** area. Assign the output values to data elements of the calling flow rule.

   Click on to automatically insert data elements with matching names and types to assign the outputs to. Only outputs not yet assigned will be affected.



The ⇨ button opens the specified decision table in the editor.

Related Concepts.

- Section 3.5.5, “Call Decision Table” [39]
- Section 3.7, “Decision Table” [48]

Related Tasks.

- Section 4.10.1, “Using the Code Assist” [157]
- Section 4.11.9, “Copying and pasting values” [164]

Related References.

- Section 5.6.2.6, “Call Decision Table” [235]

4.3.17. Editing a Call Service Element

In order to edit a call service element open its **Properties** and select the **Call Service** tab and do the following:

1. Select in the field **Call Service** the service that should be called. You can call services from the same package or from any package that is defined to be reused.

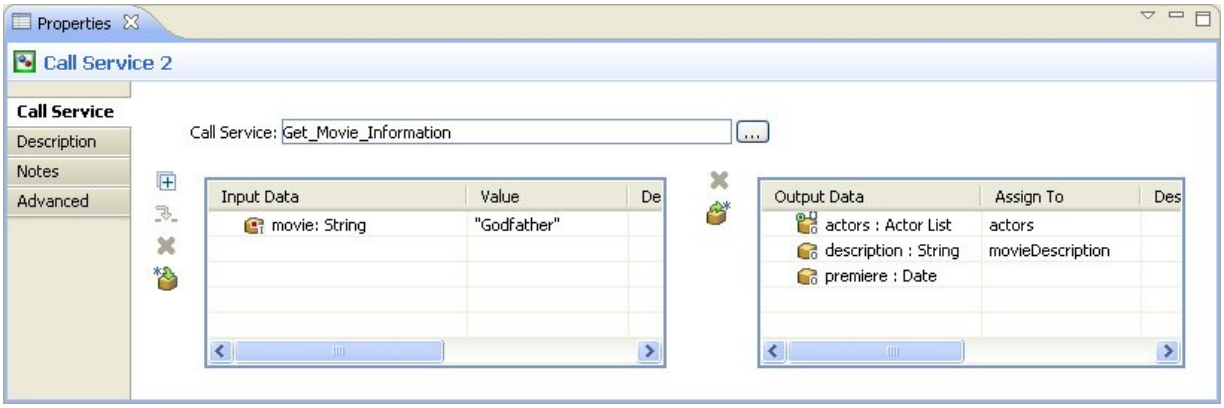
   Press **Ctrl**+**Space** for content assist or click on **...** to choose the service from a list of available services.

2. The required input data elements of the service are displayed in the **Input Data** area. You have to specify values for at least the required inputs.

   Click on to automatically insert data elements as input values, when they have matching name and type. Only inputs still without a value will be affected.

3. The output data elements of the service are displayed in the **Output Data** area. Assign the output values to data elements of the calling flow rule.

   Click on to automatically insert data elements with matching names and types to assign the outputs to. Only outputs not yet assigned will be affected.



Related Concepts.

- Section 3.5.6, “Call Service” [40]
- Section 3.19, “Service” [81]

Related Tasks.

- Section 4.10.1, “Using the Code Assist” [157]
- Section 4.11.9, “Copying and pasting values” [164]

Related References.

- Section 5.6.2.7, “Call Service” [236]

4.3.18. Editing a Return Exception Element

In order to edit a Return Exception element open its **Properties** and select the **Return Exception** tab and do the following:

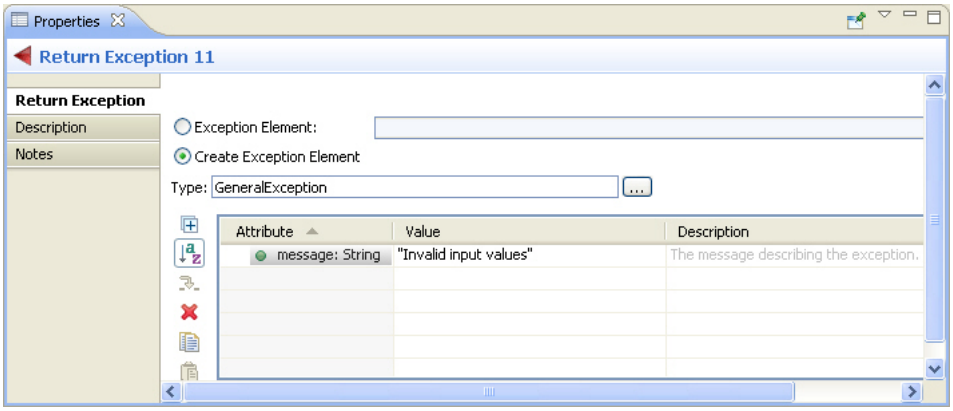
1. Either select the **Exception Element** option or the **Create Exception Element** option.

   The first option lets you specify an expression defining the returned exception element. This is useful when the exception element is already available, for example in a data element.

   The second option is used when you want to create a new exception element.

2. If you select **Exception Element**, enter an expression to specify the exception element.

   If you select **Create Exception Element**, select an exception **Type** and then insert the values for the exception attributes.



Related Concepts.

- Section 3.5.10, “Return Exception” [42]

- Section 3.14.6, “Exception” [76]

Related References.

- Section 5.6.2.9, “Return Exception Tab” [239]

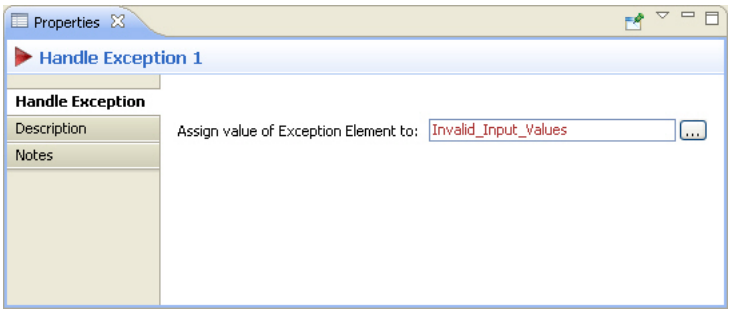
4.3.19. Editing a Handle Exception Element

In order to edit a Handle Exception element open its **Properties** and select the **Handle Exception** tab and do the following:

- In the **Assign value of Exception Element to** field, insert the name of the data element that should be assigned the value of the exception element that occurred.

  The data element must have a suitable data type, i.e. it must be an exception element. The Handle Exception element will only handle exception elements of this type (or subtypes thereof). Other exception elements will remain unhandled.

  You can also leave this empty. In that case all exception elements are handled, but you will not be able to inspect the exception element from within the Handle Exception branch.



Related Concepts.

- Section 3.5.11, “Handle Exception” [43]
- Section 3.5.10, “Return Exception” [42]
- Section 3.14.6, “Exception” [76]

Related References.

- Section 5.6.2.10, “Handle Exception Tab” [240]

4.3.20. Copying or Moving a Branch of a Flow Rule

To copy a branch of a flow rule, do the following:

1. Select the rule element which is the root of the branch you want to copy.
2. Right-click and select **Copy** from the context menu. You can also use the **Ctrl**+**C** key combination to copy it.
3. Now, select the rule element after which you want to paste the previously copied branch.
4. Right-click and select **Paste** from the context menu or press **Ctrl**+**V** to paste the branch.
5. A copy of the previously copied rule element and its children is pasted.

A case in a decision can only be pasted within a decision.

Alternatively, you can copy or move a branch with drag&drop.

1. Click on the rule element which is the root of the branch you want to copy or move and hold the mouse button pressed down.

2. Drag the branch to its destination. If you want to create a copy of the branch you must also press the **Ctrl** key. Otherwise the branch is moved.
3. Let go of the mouse button to drop the branch.

Related Tasks.

- Section 4.3.21, “Copying or Moving a Single Rule Element” [120]

4.3.21. Copying or Moving a Single Rule Element

1. Copying and moving single rule elements is done using drag&drop. Select a rule element and hold down the left mouse button.
2. Press and hold the **Alt** key. This will only copy or move the selected element but not its successors.
3. Drag the rule element to its destination. If you want to create a copy you must also press the **Ctrl** key in addition to the **Alt** key. Otherwise the rule element is moved.
4. Let go of the mouse button to drop the rule element.

Related Tasks.

- Section 4.3.20, “Copying or Moving a Branch of a Flow Rule” [119]

4.3.22. Deleting a Branch of a Flow Rule

To remove a rule element and all its successors (a branch of a flow rule), do the following:

1. Right-click on the rule element you would like to delete and select the **Delete** menu item. Alternatively you can select the rule element and press the **Del** key.
2. The rule element including all its successors are deleted.

Related Tasks.

- Section 4.3.23, “Deleting a Single Rule Element” [120]

4.3.23. Deleting a Single Rule Element

To remove a single rule element in a flow rule but keep its successors, do the following:

1. Right-click on the rule element and select the **Delete This Element Only** menu item. Alternatively you can select the rule element and press **Alt**+**Del**.
2. The rule element is deleted and its successors are attached to the element's predecessor.

Related Tasks.

- Section 4.3.22, “Deleting a Branch of a Flow Rule” [120]
- Section 4.3.24, “Deleting Multiple Rule Elements” [120]

4.3.24. Deleting Multiple Rule Elements

You can delete several rule elements simultaneously.

1. Select multiple elements by holding down the **Ctrl** key while selecting them with the mouse.
2. Then use the right mouse button to select the **Delete** menu item. Alternatively, press **Del**.

Be aware that this deletes all selected rule elements including their successors.

Related Tasks.

- Section 4.3.22, “Deleting a Branch of a Flow Rule” [120]

4.3.25. Adding a Branch Description

1. Select the **Describe Branch** tool from the palette
2. Click on the rule element which is the root of the branch that you want to describe.
3. A box around the branch will appear with the branch description at the top.
4. Double-click the empty branch description. This will open the inplace editor.
5. Enter the description.
6. Press **Ctrl**+**Enter** to close the editor or click with the mouse outside of the editor.

Related Concepts.

- Section 3.5.12, “Branch Description” [44]

4.3.26. Deleting a Branch Description

1. Select the branch description shown at the top of the box around the branch.
2. Then use the right mouse button to select the **Delete** menu item. Alternatively, press **Del**.

Related Concepts.

- Section 3.5.12, “Branch Description” [44]

4.3.27. Adding a Note

1. Select the **Add Note** tool from the **Palette**
2. Click on the rule element where you want to attach the note.
3. A note will appear to the right of the flow rule.
4. Double-click the empty note. This will open the inplace editor.
5. Enter the text for the note.
6. Press **Ctrl**+**Enter** to close the flow rule editor or click with the mouse outside of the editor.

Alternatively you can use the **Properties** view to enter notes.

1. Select the rule element where you want to attach the note.
2. In the **Properties** view activate the **Notes** tab.
3. Click on the button to add a new note.
4. Enter the text of the note.

Related Concepts.

- Section 3.15, “Description and Note” [78]

Related References.

- Section 5.6.1.2, “Notes Tab” [230]

4.3.28. Deleting a Note

1. Select the note you want to delete.
2. Use the right mouse button to select the **Delete** menu item. Alternatively, press **Del**.

Alternatively you can use the **Properties** view to delete notes.

1. Select the rule element whose notes you want to delete.
2. In the **Properties** view activate the **Notes** tab.
3. Click on the button next to the note you want to delete .

Related Concepts.

- Section 3.15, “Description and Note” [78]

Related References.

- Section 5.6.1.2, “Notes Tab” [230]

4.3.29. Activating/Deactivating a Rule Element

1. Right-click the rule element that you want to activate/deactivate and select the **Activate** or **Deactivate** menu item, respectively.
2. The element is activated/deactivated. Deactivated elements have a small icon attached ( ) and will be greyed out including all its successors.

Related Concepts.

- Section 3.5.14, “Rule Element Deactivation” [45]

4.3.30. Navigating to a Specific Rule Element

Every rule element within a flow rule has an ID (a number) that uniquely identifies it.

To find the rule element with a specific ID, do the following:

1. Make sure a flow rule editor is activated. Press **Ctrl**+**L**.
2. A dialog appears where you can enter the ID of a rule element. A message is shown and **OK** is disabled when the entered ID does not exist in the flow rule.
3. Press **OK**. The rule element with the given ID is selected.

Related Concepts.

- Section 3.5, “Flow Rule Element” [31]
- Section 3.4, “Flow Rule” [29]

4.3.31. Undoing Changes

You can undo individual operations by selecting **Edit** > **Undo [Operation]** from the menu. The last operation you carried out is shown in place of [Operation]. Alternatively, press the **Ctrl**+**Z** key combination to undo the last operation performed.

To redo undone operations, select **Edit** > **Redo [Operation]** from the menu. You can also use the **Ctrl**+**Y** key combination.

Related References.

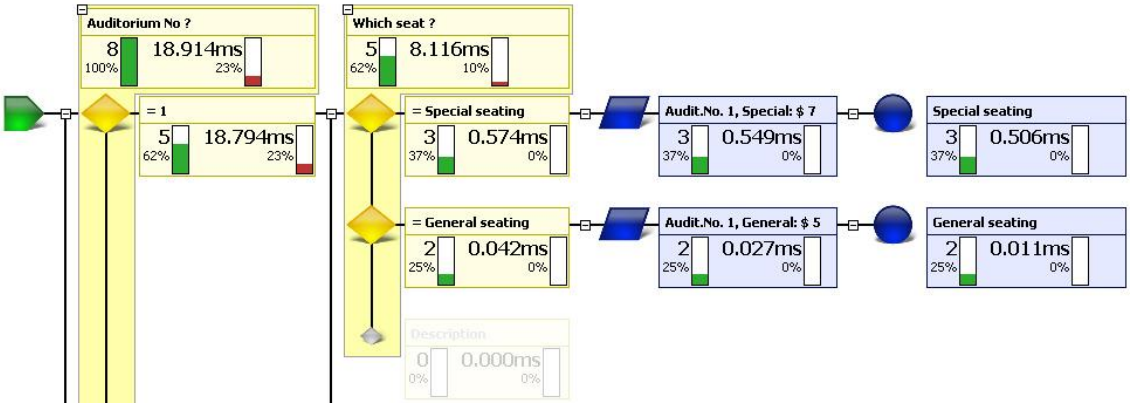
- Section 5.8, “Hotkeys” [269]

4.3.32. Displaying Statistics

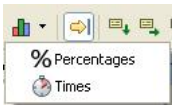
In order to display statistics, do the following:

1. Open the flow rule or decision table in the editor for which you want to view the statistics.

2. Click on the ( ) icon itself in the toolbar to show or hide statistics. The icon will toggle between a white bar-chart and a colored barchart, indicating whether the display of statistics is turned off (white) or on (colored).



3. Click on the small arrow to the right of the icon to open a drop-down which allows you to further specify what statistical information should be displayed.



With the navigation in the statistics view, you can focus on the statistics for a specific test within a test suite or a specific test case within a test.

Related Tasks.

- Section 4.11.22, “Creating and Configuring Statistics” [169]
- Section 4.3.33, “Displaying Externally Generated Statistics” [123]

Related References.

- Section 5.5.7, “Statistics View” [227]

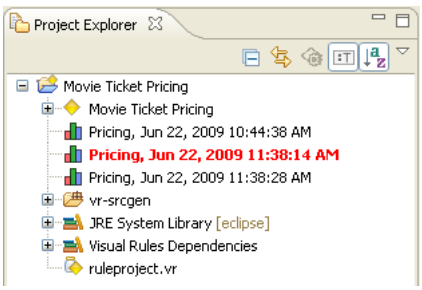
4.3.33. Displaying Externally Generated Statistics

It is possible to display statistics files which are generated outside the Visual Rules Modeler. To display such a statistics file, do the following:

1. Open the **Project Explorer** and paste the statistics file directly into a project or any sub-folder you like. The **Project Explorer** shows the name of the entry rule as well as the creation date and time of the statistics file.

Only statistics files with the file extension .vrstatistic are recognized as Visual Rules statistics file.

2. Double click on the statistics tree item to activate the statistics (activated statistics are marked red).

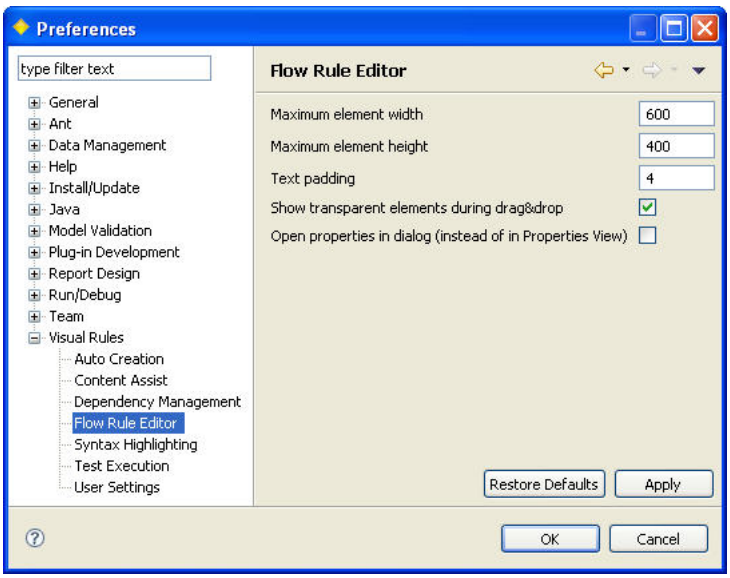


Related Tasks.

- Section 4.11.22, “Creating and Configuring Statistics” [169]
- Section 4.3.32, “Displaying Statistics” [122]

4.3.34. Changing Flow Rule Editor Preferences

1. Select **Window** > **Preferences** to open the preferences dialog.
2. Click on the plus sign to the left of the **Visual Rules** item.
3. Click on the **Flow Rule Editor** item to view the preferences for the flow rule editor.



4. Change the settings as desired.
5. If you would like to reset the preferences to their default values, click on **Restore Defaults**.
6. Click **OK** to confirm your changes.

Related References.

- Section 5.7.2, “Flow Rule Editor Preferences” [263]

4.3.35. Exporting a Rule as an Image

Visual Rules provides an option for exporting a rule as an image. You can either export the image to the clipboard or to a file. The following file formats are supported:

- Portable Network Graphics (PNG) (Eclipse 3.3 only)
- Bitmap (BMP)
- JPEG (JPG)

To export a rule as an image to the clipboard, do the following:

1. Open the rule to be exported in the rule editor.
2. Right-click anywhere in the rule. Select **Export Image -> To Clipboard** from the context menu.
3. The image is now in the clipboard and can be pasted in other applications.

To export a rule as an image to a file, do the following:

1. Open the rule to be exported in the rule editor.
2. Right-click anywhere in the rule. Select **Export Image -> To File...** from the context menu. A file selection box appears.
3. Specify the directory, name and extension (either `.png`, `.bmp` or `.jpg`) of the image file.
4. Press **Save** to export the image.

The exported image shows the rule exactly as displayed in the rule editor. So you can e.g. collapse unimportant branches before you export the image.

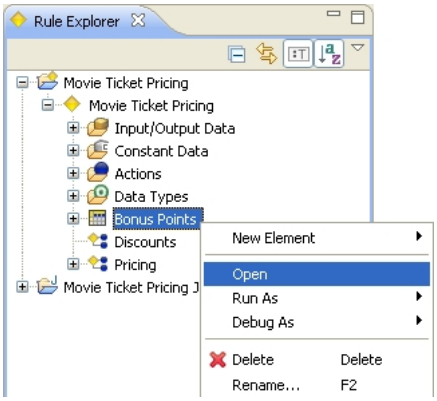
4.4. Working with Decision Tables

The following sections include detailed descriptions for working with decision tables and the decision table editor.

4.4.1. Opening the Decision Table Editor

- In the **Rule Explorer** double-click on a decision table ( ) to open the decision table editor.

  Alternatively, you can right-click on the decision table and select **Open**.



You can also open the **Decision Table Editor** for a decision table that is referenced in a call decision table element. To do so, press the **Ctrl** key and click on the reference in the **Decision Table Editor**.

Related Concepts.

- Section 3.8, “Decision Table Editor” [50]
- Section 3.7, “Decision Table” [48]

Related References.

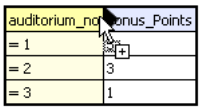
- Section 5.5.2, “Project Explorer View” [223]

4.4.2. Adding a new Decision Column or Row

In order to add a new decision column or row to the decision table, do the following:

Option 1:

1. Select the **Decide** element in the palette by clicking on it.
2. Now, move the mouse over an existing yellow condition header of the decision table. A black arrow will appear to show you where the new decision will be added. Depending on the existing decision columns and rows, this can be either before, after, above or below an existing decision. Accordingly, the black arrow will point to the left, to the right, up or down. Move the mouse until the arrow points into the direction you want.



A stop (⃠) icon indicates that the decision table element cannot be added at this location.

3. When you see a black arrow, click again and the new decision column or row will be inserted.

Option 2:

1. Select an input data element from the **Rule Context** palette and drag it.
2. Now, move the mouse over an existing yellow condition header of the decision table. A black arrow will appear to show you where the new decision will be added. Depending on the exising decision columns and rows, this can be either before, after, above or below an existing decision. Accordingly, the black arrow will point to the left, to the right, up or down. Move the mouse until the arrow points into the direction you want.

   A stop (⃠) icon indicates that the decision table element cannot be added at this location.
3. When you see a black arrow, drop the input data element and the new condition column or row will be inserted. The input data element is automatically inserted in the condition header.

Alternatively, you can use the **Insert** key to add a new condition.

Related Concepts.

- Section 3.7.1, “Condition Column/Row” [49]

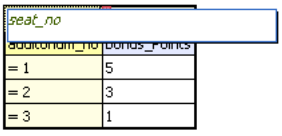
Related Tasks.

- Section 4.4.3, “Editing Conditions” [126]
- Section 4.4.4, “Adding a new Condition” [127]
- Section 4.4.5, “Adding an Else Condition” [127]
- Section 4.4.8, “Rearranging Condition Columns or Rows” [129]

4.4.3. Editing Conditions

In order to edit a condition header in the decision table, do the following:

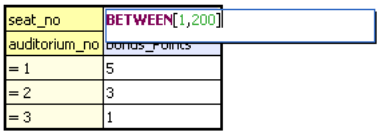
1. Double-click on the condition header in the decision table. This will open the inplace editor.
2. Enter the input data element that should be checked.



3. Press **Enter** to close the editor or click with the mouse outside of the editor.

In order to edit conditions in the decision table, do the following:

1. Double-click on the condition in the decision table. This will open the inplace editor.
2. Enter the expression for the condition.



3. Press **Enter** to close the editor or click with the mouse outside of the editor.

Related Concepts.

- Section 3.7.1, “Condition Column/Row” [49]

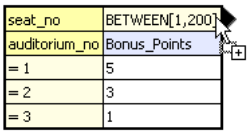
Related Tasks.

- Section 4.4.2, “Adding a new Decision Column or Row” [125]
- Section 4.4.4, “Adding a new Condition” [127]
- Section 4.4.5, “Adding an Else Condition” [127]
- Section 4.4.8, “Rearranging Condition Columns or Rows” [129]

4.4.4. Adding a new Condition

In order to add a new condition in the decision table editor, do the following:

1. Select the **Decide** element in the palette by clicking on it.
2. Now, move the mouse over an existing condition of the decision table. A black arrow will appear to show you where the new condition will be added. This can be for condition columns above or below or for condition rows before or after an existing condition or condition header. Accordingly, the black arrow will point to the left, to the right, up or down. Move the mouse until the arrow points into the direction you want.

   A stop (⃠) icon indicates that the decision table element cannot be added at this location.
3. When you see a black arrow, click again and the new condition will be inserted.

Alternatively, you can use the **Insert** key to add a new condition.

In order to add multiple new condition columns or rows to the decision table, do the following:

1. Select the **Decide** element in the palette by clicking on it.
2. Now, drag the mouse over an existing condition of the decision table. A black arrow will appear to show you where the new decisions will be added. Depending on the exising decision columns and rows, this can be either before, after, above or below an existing condition. Accordingly, the black arrow will point to the left, to the right, up or down. Move the mouse until the arrow points into the direction you want.

   A stop (⃠) icon indicates that the decision table element cannot be added at this location.
3. When you see a black arrow, press **Ctrl** and drop the element. A dialog appears to allow the entering of the number of new condition columns or rows, which will be inserted. Enter the number as desired and press **OK**. The conditon columns or rows are automatically inserted in the decision table.

Related Concepts.

- Section 3.7.1, “Condition Column/Row” [49]

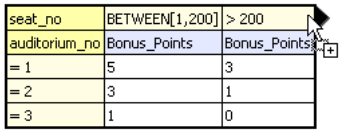
Related Tasks.

- Section 4.4.2, “Adding a new Decision Column or Row” [125]
- Section 4.4.3, “Editing Conditions” [126]
- Section 4.4.5, “Adding an Else Condition” [127]
- Section 4.4.8, “Rearranging Condition Columns or Rows” [129]

4.4.5. Adding an Else Condition

In order to add an else condition to a decision table, do the following:

1. Select the **Else** element in the palette by clicking on it.
2. Move the mouse to the last condition of any decision. A black arrow will appear to show you where the else condition will be added. This can be only after the last condition of a decision. Accordingly, the black arrow will point to the right or down. Move the mouse until the arrow points into the direction you want.



   A stop (⃠) icon indicates that the decision table element cannot be added at this location.
3. When you see a black arrow, click again and the else condition will be inserted.

Related Concepts.

- Section 3.7.1, “Condition Column/Row” [49]

Related Tasks.

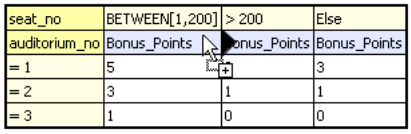
- Section 4.4.2, “Adding a new Decision Column or Row” [125]
- Section 4.4.3, “Editing Conditions” [126]
- Section 4.4.4, “Adding a new Condition” [127]
- Section 4.4.8, “Rearranging Condition Columns or Rows” [129]

4.4.6. Adding a new Assignment Column

In order to add a new assignment column to the decision table, do the following:

Option 1:

1. Select the **Assign** element in the palette by clicking on it.
2. Now, move the mouse over an existing blue column header. A black arrow will appear to show you where the new assignment will be added. This can be either before or after an existing assignment, action or exception column. Accordingly, the black arrow will point to the left or to the right. Move the mouse until the arrow points into the direction you want.



   A stop (⃠) icon indicates that the decision table element cannot be added at this location.
3. When you see a black arrow, click again and the new assignment column will be inserted.

Option 2:

1. Select an output data element from the **Rule Context** palette and drag it.
2. Now, move the mouse over an existing blue column header. A black arrow will appear to show you where the new assignment will be added. This can be either before or after an existing assignment, action or exception column. Accordingly, the black arrow will point to the left or to the right. Move the mouse until the arrow points into the direction you want.

   A stop (⃠) icon indicates that the decision table element cannot be added at this location.
3. When you see a black arrow, drop the output data element and the new assignment column will be inserted. The output data element is automatically inserted in the assignment column header.

Related Concepts.

- Section 3.7.2, “Assignment Column” [49]

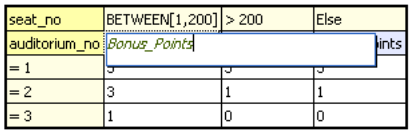
Related Tasks.

- Section 4.4.7, “Editing an Assignment” [129]
- Section 4.4.16, “Rearranging Assignment/Action/Exception Columns” [133]

4.4.7. Editing an Assignment

In order to edit the assignment column header in the decision table, do the following:

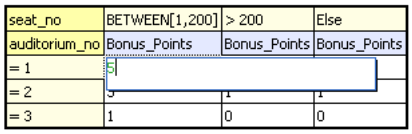
1. Double-click on the column header. This will open the inplace editor.
2. Enter the name of an output data element that will receive the corresponding value.



3. Press **Enter** to close the editor or click with the mouse outside of the editor.

In order to enter values in cells of an assignment column, do the following:

1. Double-click on the cell in the decision table. This will open the inplace editor. You can also simply start typing when a cell is selected.
2. Enter the value that should be assigned. This can be just a simple value or some expression. If left empty, the decision table will simply not assign any value in that case.



3. Press **Enter** to close the editor or click with the mouse outside of the editor.

Related Concepts.

- Section 3.7.2, “Assignment Column” [49]

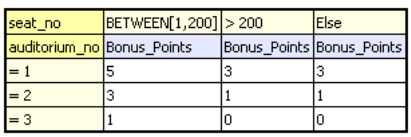
Related Tasks.

- Section 4.4.6, “Adding a new Assignment Column” [128]
- Section 4.4.16, “Rearranging Assignment/Action/Exception Columns” [133]

4.4.8. Rearranging Condition Columns or Rows

In order to rearrange condition columns or rows, do the following:

1. Select the condition header of the decision that should be moved and drag it.
2. Now, move the mouse over an existing condition header of the decision table. A black arrow will appear to show you where the new decision will be added. Depending on the exising decision columns and rows, this can be either before, after, above or below an existing decision. Accordingly, the black arrow will point to the left, to the right, up or down. Move the mouse until the arrow points into the direction you want.



A stop (⃠) icon indicates that the decision table element cannot be added at this location.

3. When you see a black arrow, drop the decision and the whole column or row will be moved.

If you rearrange condition columns or rows like this, the decision table is restructured accordingly. This may introduce new cells which are initially empty.

seat_no	auditorium_no	Bonus_Points
BETWEEN[1,200]	= 1	5
	= 2	3
	= 3	1
> 200	= 1	3
	= 2	1
	= 3	0
Else	= 1	3
	= 2	1
	= 3	0

Related Concepts.

- Section 3.7.1, “Condition Column/Row” [49]

Related Tasks.

- Section 4.4.2, “Adding a new Decision Column or Row” [125]
- Section 4.4.3, “Editing Conditions” [126]
- Section 4.4.4, “Adding a new Condition” [127]
- Section 4.4.5, “Adding an Else Condition” [127]

4.4.9. Describing Decision Table Elements

In order to insert a description to any decision table element, do the following:

1. Activate the display of descriptions ( ) in the toolbar drop-down ( ).
2. Double-click on a description in the decision table to start the inplace editor.
3. Enter the description.

Alternatively, you can use the **Description** tab:

1. Select the cell of the decision table you want to describe.
2. Go to the **Properties** view.
3. Insert the description on the **Description** tab or add notes on the **Notes** tab

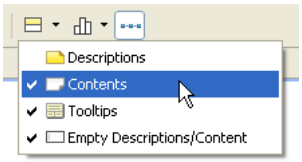
4.4.10. Navigating in Decision Tables

Navigate through the decision table cells with the following hot keys:

- Open inplace editor of cell with **Enter** or simply by starting to type
- Close inplace editor of cell with **Enter**
- Navigate through the cells of the decision table with the arrow keys

4.4.11. Configuring the Appearance of the Decision Table Editor

Via the **View** ( ) dropdown toolbar button, you can configure what data should appear in the decision table editor. By activating the button, you can toggle highlighting of the cells for the conditions matching the selected cell. The latter feature dramatically improves the readability of large decision tables.



Alternatively, you can also right-click in the decision table editor and select the according entries from the **View** context menu. The following table shows the individual options.

Table 4.2. Individual options for configuring the appearance of the decision table editor

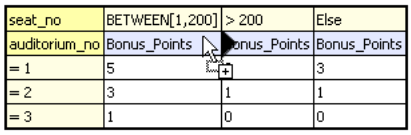
Option	Description
Descriptions	Show/hide descriptions of decision table cells
Contents	Show/hide contents of decision table cells
Empty Descriptions/Content	Show/hide empty descriptions or content of decision table cells
Highlight Condition Path	Toggle highlighting of the cells for the conditions matching the selected cell

4.4.12. Adding a new Action Column

In order to add a new action column to a decision table, do the following:

Option 1:

1. Select the **Fire Action** element in the palette by clicking on it.
2. Now, move the mouse over an existing blue column header. A black arrow will appear to show you where the new action column will be added. This can be either before or after an existing assignment, action or exception column. Accordingly, the black arrow will point to the left or to the right. Move the mouse until the arrow points into the direction you want.

   A stop (⃠) icon indicates that the decision table element cannot be added at this location.
3. When you see a black arrow, click again and the new action column will be inserted.

Option 2:

1. Select an action from the **Rule Context** palette and drag it.
2. Now, move the mouse over an existing column header. A black arrow will appear to show you where the new action column will be added. This can be either before or after an existing assignment, action or exception column. Accordingly, the black arrow will point to the left or to the right. Move the mouse until the arrow points into the direction you want.

   A stop (⃠) icon indicates that the decision table element cannot be added at this location.
3. When you see a black arrow, drop the action and the new action column will be inserted. The action is automatically inserted in the action column header.

Related Concepts.

- Section 3.7.3, “Action Column” [49]

Related Tasks:

- Section 4.4.13, “Editing an Action Column” [132]

- Section 4.4.16, “Rearranging Assignment/Action/Exception Columns” [133]

4.4.13. Editing an Action Column

In order to edit an action column header, do the following:

1. Double-click on the cell in the decision table. This will open the inplace editor.
2. Specify the action that should be fired depending on conditions.

seat_no	BETWEEN[1,200]		> 200		Else	
auditorium_no	bonus_points	special_seating ...	bonus_points	Action	bonus_points	Action
= 1	25	-	25	-	25	-
= 2	25	-	25	-	25	-
= 3	25	-	25	-	25	-

3. Press **Enter** to close the editor or click with the mouse outside of the editor.
4. Select the action column header and open the **Properties** view.
5. Insert the action specific **Fire Action** settings.

In order to specify in which cases the action should fire or not, do the following:

- Double-click on a cell in the action colum or press the **Space** key.

  This will toggle between a small cross (x) and a dash (-). The action will be fired for those cells that contain a cross.

seat_no	BETWEEN[1,200]		> 200		Else	
auditorium_no	bonus_points	special_seating	bonus_points	special_seating	bonus_points	special_seating
= 1	25	x	25	-	25	-
= 2	25	x	25	-	25	-
= 3	25	-	25	-	25	-

Related Concepts.

- Section 3.7.3, “Action Column” [49]

Related Tasks.

- Section 4.4.12, “Adding a new Action Column” [131]
- Section 4.4.16, “Rearranging Assignment/Action/Exception Columns” [133]

4.4.14. Adding a new Exception Column

In order to add a new exception column in the decision table editor, do the following:

1. Select the **Return Exception** element in the palette by clicking on it.
2. Now, move the mouse over an existing blue column header. A black arrow will appear to show you where the new exception will be added. This can be either before or after an existing assignment, action or exception column. Accordingly, the black arrow will point to the left or to the right. Move the mouse until the arrow points into the direction you want.

seat_no	BETWEEN[1,200]	> 200	Else
auditorium_no	Bonus_Points	onus_Points	Bonus_Points
= 1	5		3
= 2	3	1	1
= 3	1	0	0

   A stop (⃠) icon indicates that the decision table element cannot be added at this location.

3. When you see a black arrow, click again and the new exception column will be inserted.

Related Concepts.

- Section 3.7.4, “Exception Column” [50]

Related Tasks.

- Section 4.4.15, “Editing Exception Columns” [133]
- Section 4.4.16, “Rearranging Assignment/Action/Exception Columns” [133]

4.4.15. Editing Exception Columns

In order to edit an exception column header, do the following:

1. Double-click on the column header in the decision table. This will open the inplace editor.
2. Enter an exception that should be returned depending on conditions.
3. Press **Enter** to close the editor or click with the mouse outside of the editor.
4. Select the exception column header and open the **Properties** view.
5. Insert the exception specific **Return Exception** settings.

In order to specify in which cases the exception should occur or not, do the following:

- Double-click on a cell in the exception column or press the **Space** key.

  This will toggle between a small cross (x) and a dash (-). The exception will be returned for those cells that contain a cross.

seat_no	BETWEEN[1,200]		> 200		Else	
auditorium_no	GeneralException	bonus_points	GeneralException	bonus_points	GeneralException	bonus_points
= 1	-	5	-	3	x	---
= 2	-	3	-	1	x	---
= 3	-	1	-	0	x	---

Related Concepts.

- Section 3.7.4, “Exception Column” [50]

Related Tasks.

- Section 4.4.14, “Adding a new Exception Column” [132]
- Section 4.4.16, “Rearranging Assignment/Action/Exception Columns” [133]

4.4.16. Rearranging Assignment/Action/Exception Columns

In order to change the order of assignment, action and exception columns, do the following:

1. Select the column header of the column that should be moved and drag it.
2. Now, move the mouse over an existing decision table element header. A black arrow will appear to show you where the moved element will be inserted. This can be either after an existing decision or beside an assignment, action or exception. Accordingly, the black arrow will point to the left or to the right. Move the mouse until the arrow points into the direction you want.

seat_no	BETWEEN[1,200]		> 200		Else	
auditorium_no	bonus_points	special_seating	bonus_points	special_seating	bonus_points	special_seating
= 1	25	x	25	-	25	-
= 2	25	x	---	-	25	-
= 3	25	-	25	-	25	-

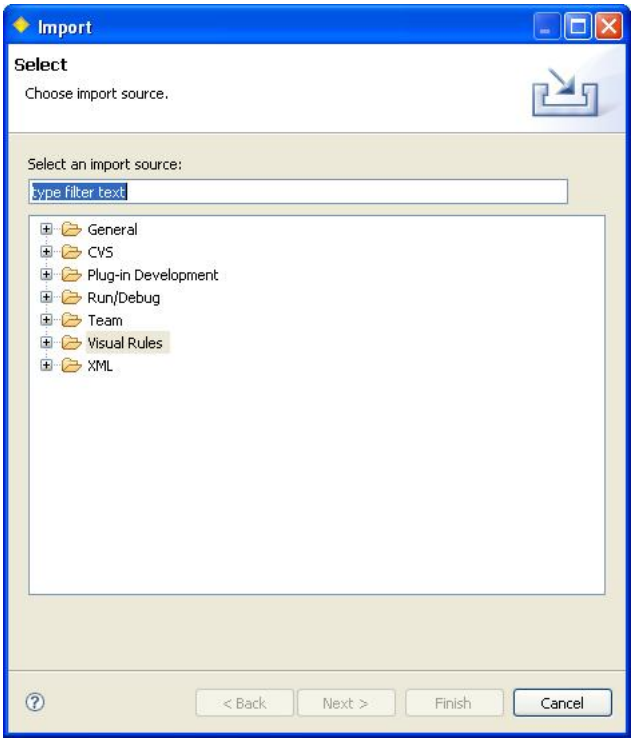
   A stop (⃠) icon indicates that the decision table element cannot be added at this location.
3. When you see a black arrow, click again and the element will be moved.

4.4.17. Importing an Excel Sheet as a Decision Table

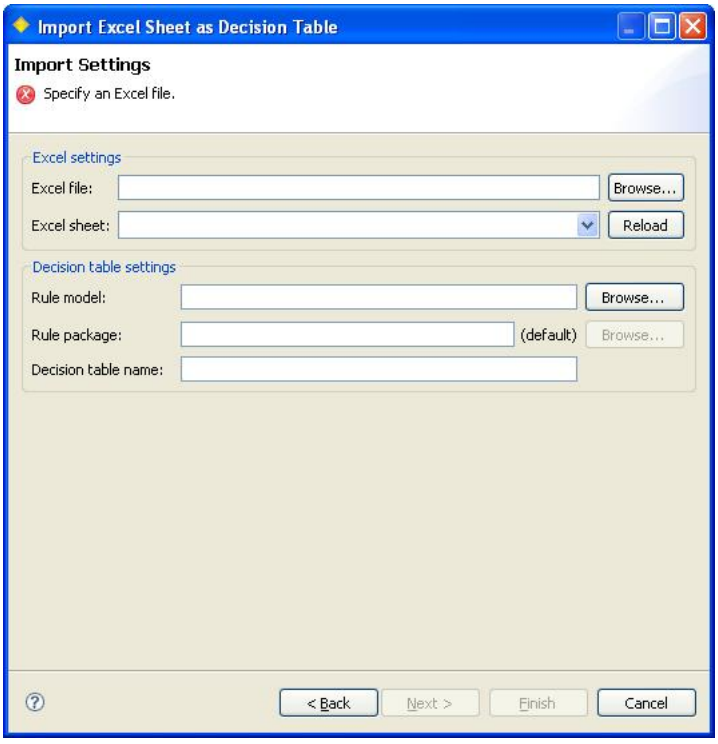
You can import an Excel sheet as a decision table.

1. Select **File > Import** in the menu.

2. The **Import** wizard appears.

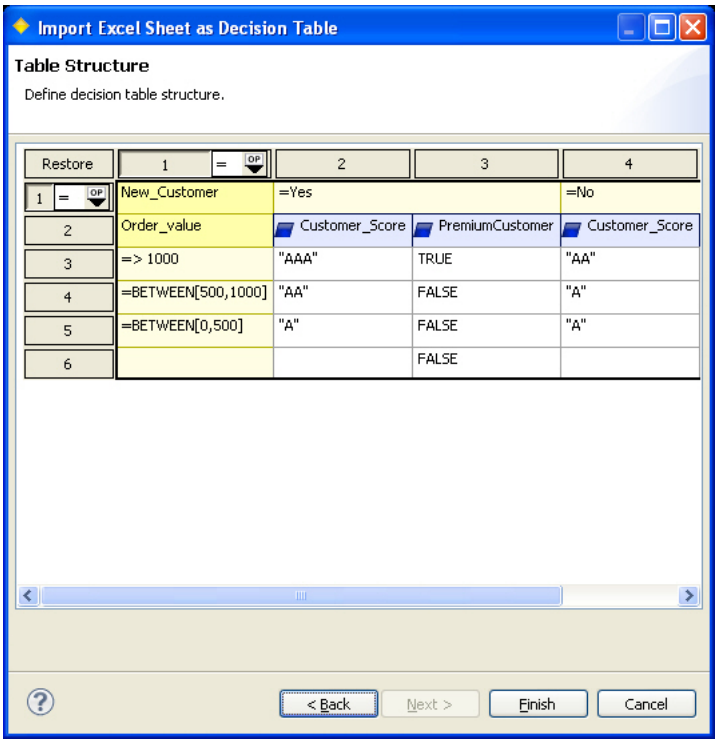


3. Open the folder **Visual Rules**.
4. Select **Excel Sheet As Decision Table**.
5. Click on **Next >**.
6. The dialog **Import Excel Sheet as Decision Table** appears:



7. Specify the relevant Excel file and sheet.
8. Select the rule model and rule package where the new decision table should be located. You can click on the corresponding **Browse...** buttons to select the rule model and rule package from a list.

9. Enter a name for the new decision table.
10. Click on **Next >**.
11. The dialog shows the Excel sheet as a Decision Table in its preliminary form:



12. To specify a column/row as a condition column/row, click on the respective header.
13. To change the comparison operators in a decision column/row, click on in the respective header and select an operator from the drop-down menu.
14. To specify a column as an assignment/action/exception column, right-click in the respective cell and select the kind of column.

Further adjustments can be carried out once the table has been imported.

15. Press **Finish** to create the new decision table. The decision table editor will automatically show the new decision table.

Related Concepts.

- Section 3.7, “Decision Table” [48]
- Section 3.3, “Rule Package” [26]
- Section 3.2, “Rule Model” [25]

Related References.

- Section 5.2.3, “New Rule Wizard” [201]
- Section 5.5.2, “Project Explorer View” [223]

4.4.18. Converting a Decision Table into a Flow Rule

You can convert a decision table into a flow rule.

1. In the **Rule Explorer**, right-click on the decision table. This will open a context menu.

2. Select **Convert to Flow Rule**.
3. The decision table is replaced by a corresponding flow rule.

Related Concepts.

- Section 3.7, “Decision Table” [48]

Related References.

- Section 5.5.2, “Project Explorer View” [223]

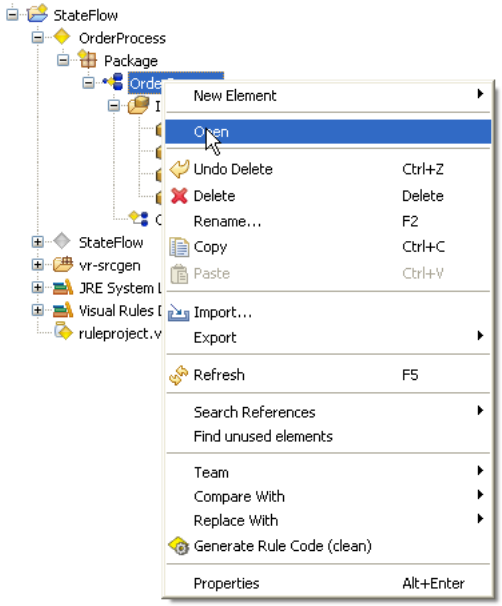
4.5. Working with State Flows

The following sections include detailed descriptions for working with state flows rules and the state flow editor.

4.5.1. Opening the State Flow Editor

- In the **Rule Explorer** double-click on a state flow ( ) to open the state flow editor.

  Alternatively, you can right-click on the state flow and select **Open**.



Related Concepts.

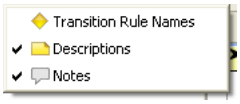
- Section 3.11, “State Flow Editor” [54]
- Section 3.9, “State Flow” [52]

Related References.

- Section 5.5.2, “Project Explorer View” [223]

4.5.2. Configuring the Appearance and Capabilities of the State Flow Editor

You can configure the appearance as well as the capabilities of the state flow editor via the **View** ( ) dropdown toolbar button.



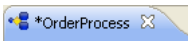
Alternatively, you can also right-click in the state flow editor and select the according entries from the **View** context menu. The following table shows the individual options.

Table 4.3. Individual options for configuring the appearance and capabilities of the state flow editor

Option	Description
Transition Rule Names	Show/hide names of transition rules
Descriptions	Show/hide description of the state flow
Notes	Show/hide notes of transition rules and states

You can also set the line style of the state flow, e.g. to either rectangular, oblique or rounded. This can be done via the line style menu in the toolbar (button →). These settings are also available in the **Preferences** (Visual Rules > State Flow Editor).

4.5.3. Saving Changes

1. When you do any changes to a state flow, the tab of the state flow editor will show an asterisk right in front of the state flow name.


2. To save the changes made in the current editor, press the **Save** button ( ) on the toolbar. This button is only enabled when changes were made.

   Alternatively you can press **Ctrl**+**S** or select the **File > Save** menu item.

   If you want to save all unsaved changes and not just the changes made in the current editor, you can press **Ctrl**+**Shift**+**S** or select the **File > Save All** menu item.

Related Concepts.

- Section 3.11, “State Flow Editor” [54]

Related References.

- Section 5.5.2, “Project Explorer View” [223]

4.5.4. Adding New States

1. Select the respevctive element in the palette by clicking on it.
2. Now, move the mouse into the state flow editor and click again. The new state will be added.

You can drag the state to any location within the editor. A state can be turned into an end state and the other way round via the context menu.

Related Concepts.

- Section 3.10, “State Flow Element” [53]
- Section 3.11, “State Flow Editor” [54]

Related References.

- Section 5.3.3.1, “State Flow Editor Palette” [209]

4.5.5. Creating Transitions

1. Select the transition element in the palette by clicking on it.
2. Move the mouse into the state flow editor to the state from which the changeover starts and click again.

3. Now, move the mouse to the state where the changeover ends and click again. A new simple transition will be added.

4. To turn the simple transition into a rule-based transition, double-click on the little yellow diamond . The underlying transition rule is automatically created and added in the Rule Explorer.

You can form a transition by selecting it and dragging its corners.

Related Concepts.

- Section 3.10, “State Flow Element” [53]
- Section 3.11, “State Flow Editor” [54]

Related References.

- Section 5.3.3.1, “State Flow Editor Palette” [209]

4.5.6. Editing Descriptions of State Flow Elements

Next to each state flow element is a box that contains the description.

1. Double-click a description you want to edit. You can also just select it and start typing. The inplace editor will open.

2. Enter the description.

3. Press **Ctrl**+**Enter** to close the editor or click with the mouse outside of the editor.

Related Concepts.

- Section 3.10, “State Flow Element” [53]
- Section 3.15, “Description and Note” [78]

4.5.7. Editing a Transition Rule

A transition rule, i.e. the flow rule which a rule-based transition is based on, can be edited in the same way as any other flow rule.

A transition rule can be opened in the flow rule editor by double-clicking on the icon of the respective transition.

Related Concepts.

- Section 3.10.4, “Transition Rule” [53]

Related References.

- Section 5.6.3, “State Flow Elements” [240]

4.5.8. Copying or Moving a State Flow Element

1. Copying and moving single state flow elements is done using drag&drop. Select a state flow element and hold down the left mouse button.

2. Drag the state flow element to its destination. If you want to create a copy you must press the **Ctrl** key. Otherwise the state flow element is moved.

3. Let go of the mouse button to drop the state flow element.

4.5.9. Changing the Size of a State Flow Element

- Select a state flow element and drag the frame into any direction.

There is a minimum size for a state flow element. You can also automatically set a state flow element to its optimal size via the context menu. Optimal here means just big enough to have the related description fully displayed.

4.5.10. Deleting a State Flow Element

Deleting a state also deletes all incoming and outgoing transitions.

To remove a single state flow element in a state flow, do the following:

1. Right-click on the state flow element and select the **Delete** menu item. Alternatively you can select the state flow element and press **Del**.

2. The state flow element is deleted.

4.5.11. Adding a Note

1. Select the **Add Note** tool from the **Palette**

2. Click on the state flow element where you want to attach the note.

3. A note will appear to the right of the state flow.

You can move the note per drag&drop.

4. Double-click the empty note. This will open the inplace editor.

5. Enter the text for the note.

6. Press **Ctrl**+**Enter** to close the state flow editor or click with the mouse outside of the editor.

Alternatively you can use the **Properties** view to enter notes.

1. Select the state flow element where you want to attach the note.

2. In the **Properties** view activate the **Notes** tab.

3. Click on the button to add a new note.

4. Enter the text of the note.

Related Concepts.

- Section 3.15, “Description and Note” [78]

Related References.

- Section 5.6.1.2, “Notes Tab” [230]

4.5.12. Deleting a Note

1. Select the note you want to delete.
2. Use the right mouse button to select the **Delete** menu item. Alternatively, press **Del**.

Alternatively you can use the **Properties** view to delete notes.

1. Select the state flow element whose notes you want to delete.
2. In the **Properties** view activate the **Notes** tab.
3. Click on the button next to the note you want to delete .

Related Concepts.

- Section 3.15, “Description and Note” [78]

Related References.

- Section 5.6.1.2, “Notes Tab” [230]

4.5.13. Undoing Changes

You can undo individual operations by selecting **Edit** > **Undo [Operation]** from the menu. The last operation you carried out is shown in place of [Operation]. Alternatively, press the **Ctrl**+**Z** key combination to undo the last operation performed.

To redo undone operations, select **Edit** > **Redo [Operation]** from the menu. You can also use the **Ctrl**+**Y** key combination.

Related References.

- Section 5.8, “Hotkeys” [269]

4.6. Working with Data

The following sections contain step-by-step procedures for different tasks with data elements.

Related Concepts.

- Section 3.13, “Data” [67]
- Section 3.13.2, “Input/Output Data” [69]
- Section 3.13.3, “Internal Data” [69]
- Section 3.13.4, “Constant Data” [70]

4.6.1. Defining Input/Output Data Elements

With respect to a transition rule (in a state flow) only input data elements can be defined.

To add an input/output data element to a rule, you can simply use the **Rule Context** palette in the flow rule editor:

1. Click on the button in the Input/Output Data section to add a data element.
2. Specify the new element in the dialog that appears.

3. Press **Finish**.

In order to add an input/output data element to a rule, a rule package or a rule model in the **Rule Explorer**, do the following:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define input/output data.
2. In the **Properties** view activate the **Input/Output Data** tab.
3. Click on the + button to add a data element.

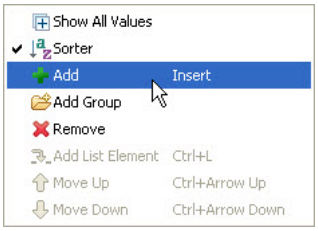
It is possible to configure input/ouput data elements as input data element, output data element or as input and output data element.

1. Double-click the input/output data element to open its **Properties**.
2. Configure the type of data element in the column **Input/Output**.
   - Select **in/out** for an input and output data element
   - Select **in** for an input data element
   - Select **out** for an output data element

To configure an input/output data element as required, do the following:

1. Double-click the input/output data element to open its **Properties**.
2. Configure the data element as required in the **Required** column. Select **Yes** for required and **No** for not required data element.

Alternatively, you can use the context menu of the **Properties** view to add an input/output data element to a rule, that contains the possible operations:



Related Concepts.

- Section 3.13.2, “Input/Output Data” [69]

4.6.2. Defining Internal Data Elements

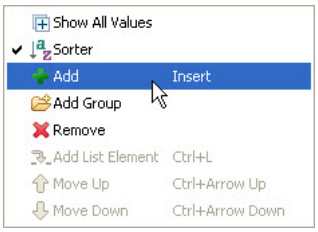
To add an internal data element to a rule, you can simply use the **Rule Context** palette in the rule editor:

1. Click on the + button in the Internal Data section to add a data element.
2. Specify the new element in the dialog that appears.
3. Press **Finish**.

In order to add an internal data element to a rule, a rule package or a rule model in the **Rule Explorer**, do the following:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define internal data.
2. In the **Properties** view activate the **Internal Data** tab.
3. Click on the + button to add a data element.

Alternatively, you can use the context menu of the **Properties** view to add an internal data element to a rule, that contains the possible operations:



Related Concepts.

- Section 3.13.3, “Internal Data” [69]

4.6.3. Defining Constant Data Elements

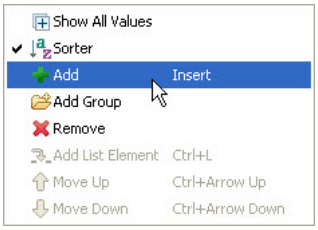
To add a constant data element to a rule, you can simply use the **Rule Context** palette in the rule editor:

1. Click on the button in the Constant Data section to add a data element.
2. Specify the new element in the dialog that appears.
3. Press **Finish**.

In order to add a constant data element to a rule, a rule package or a rule model in the **Rule Explorer**, do the following:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define constant data.
2. In the **Properties** view activate the **Constant Data** tab.
3. Click on the button to add a data element.

Alternatively, you can use the context menu of the **Properties** view to add a constant data element to a rule, that contains the possible operations:



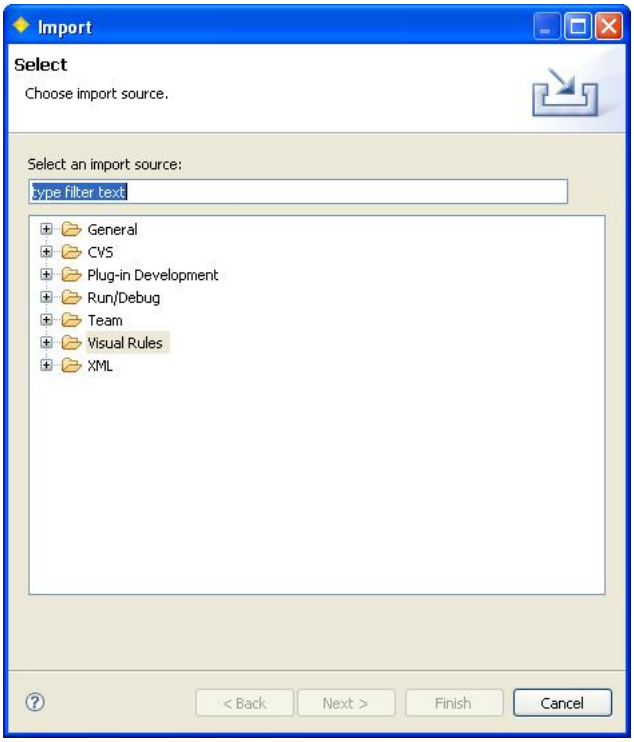
Related Concepts.

- Section 3.13.4, “Constant Data” [70]

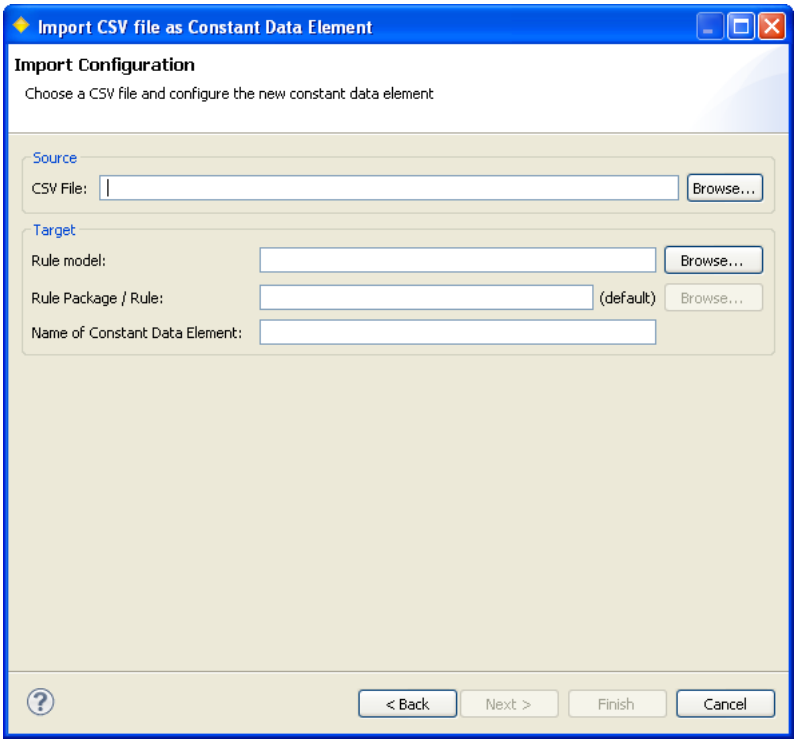
4.6.4. Importing a CSV file as a Constant Data Element

You can import a CSV file as a constant data element of the kind **List**.

1. Select **File > Import** in the menu.
2. The **Import** wizard appears.



3. Open the folder **Visual Rules**.
4. Select **CSV File as Constant Data Element**.
5. Click on **Next >**.
6. The dialog **Import CSV File as Constant Data Element** appears:

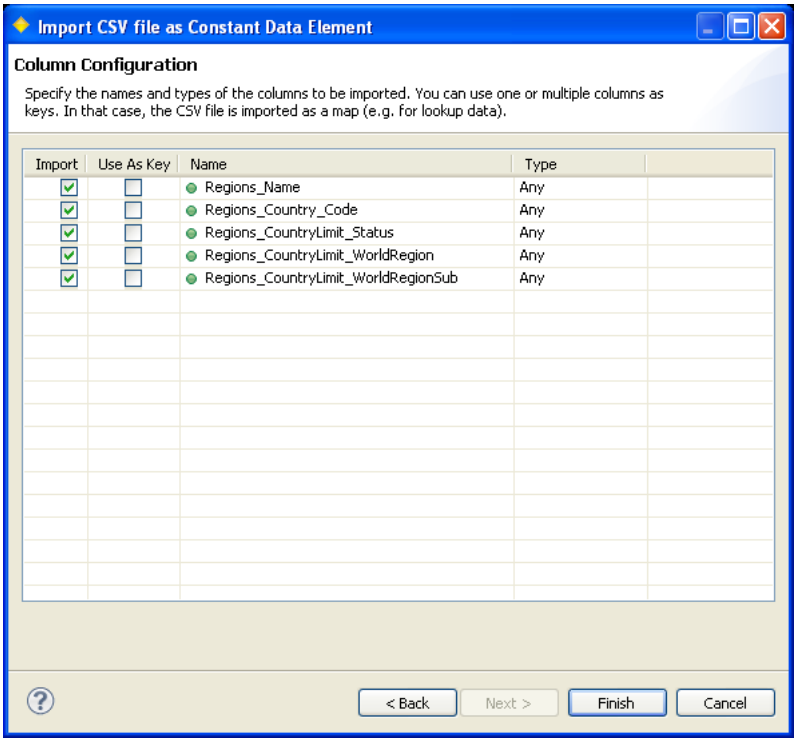


7. Specify the relevant CSV file.
8. Select the rule model and rule package where the new decisi on table should be located. You can click on the corresponding **Browse...** buttons to select the rule model and rule package from a list.

9. Enter a name for the new data element.

10. Click on **Next >**.

11. The dialog shows the columns of an entry in the CSV file:



12. Select the columns to be imported.

The individual columns will be turned into attributes of the created data element.

13. Select the columns to be used as keys, if necessary.

If you select at least one column to be used as a key, then the CSV file will be imported as a **Map**, otherwise as a **List**.

14. Specify the names and types of the respective attributes.

15. Press **Finish**.

4.6.5. Specifying the Data Type of a Data Element

Specify the type of a **Data Element** in the **Properties** of the data element.

1. Double-click the data element to open its **Properties**.

2. Select the data type in the column **Type**. You can select the standard data types or structures.

Related Concepts.

- Section 3.14.1, “Basic Data Type” [71]
- Section 3.14.3, “Structure” [74]

4.6.6. Specifying the Default Value of a Data Element

Insert a default value of a data element in the **Properties** of the data element.

1. Double-click the data element to open its **Properties**.
2. Insert the default value of the data element in the column **Default Value**.

4.6.7. Deleting Data Elements

On the **Rule Context** palette in the rule editor:

1. Select the data element that you want to delete.
2. Click on the ✖ button in the corresponding section of the **Rule Context** palette.

In the **Rule Explorer**:

1. Select the data element in the **Rule Explorer**.
2. Right-click and select the **Delete** entry from the context menu or press the **Del** key.

On the **Properties** tabs (Input/Output Data, Internal Data, Constant Data tabs):

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to delete data elements.
2. In the **Properties** view activate the according tab (either **Input/Output Data**, **Internal Data**, or **Constant Data**).
3. Select the data element in the list.
4. Click on the ✖ button to delete the data element.

Related Concepts.

- Section 3.13, “Data” [67]

4.6.8. Copying Data Elements

If you would like to copy a data element, do the following:

1. Right-mouse click on the element to be copied and select **Copy** from the contextual menu that appears. Alternatively, you can select the element and use the **Ctrl**+**C** key combination.
2. Right-mouse click on the target you want to paste the copy into and select **Paste** from the contextual menu. Alternatively, you can also select the target and use the **Ctrl+V** key combination.
3. The copy is pasted. Please be aware that the copy has a different name like the original.

When no copy can be pasted the **Paste** menu item is greyed out. This is because the copied item cannot be pasted to this location. In this case, select a different, appropriate target.

4. To give the copied item a meaningful name, rename it (using **F2**).

When copying you can also copy and paste multiple items at the same time. To do this, simply select all the elements you want. Keep the **Ctrl** key held down to select multiple items. Then carry out the procedure above.

Related Concepts.

- Section 3.13, “Data” [67]

4.6.9. Convert Data Elements

To convert data elements do the following:

1. Select the data element in the **Rule Explorer**.
2. Right-mouse click and select the **Convert To** entry from the context menu and select the new data element type.

You can also convert data elements by moving them into another data element folder. This works only if there already exists a data element in the target folder, else the target data element folder is not displayed.

Please be aware that the properties of different element types can vary. When moving between data element types information may be lost.

Related Concepts.

- Section 3.13, “Data” [67]

4.6.10. Moving Data Elements

If you would like to move a data elements in the **Rule Explorer**, you have two options:

Option 1: To move the element via drag & drop, do the following:

1. Use the left mouse button to click once on the element to be moved.
2. Keep the mouse button held down and move the mouse to the target.
3. Now let go of the mouse button. The element is moved into the target.

If the item can't be moved to a specific location, this is indicated by the ⃠ icon.

Option 2: To move the element using the keyboard, do the following:

1. Right-mouse click on the element to be moved and select **Cut** from the contextual menu that appears. Alternatively, you can select the data element and use the **Ctrl**+**X** key combination.
2. Right-mouse click on the target you want to move the element into and select **Paste** from the contextual menu that appears. Alternatively, you can also select the target and use the **Ctrl**+**V** key combination.
3. The cut element is pasted.

When moving you can also copy and paste multiple elements at the same time. To do this, simply select all the data elements you want. Keep the **Ctrl** key held down to select multiple data elements. Then carry out the procedure above.

When moving data elements you can also switch between different data element types. It is thus possible, for example, to make a internal data from a input/output data by moving the input/output data element into the internal data folder. Please be aware that the properties of different element types can vary. When moving between item types information may be lost.

If you move data elements under another rule, rule package or model, please note that the visibility of this element changes depending on the target location.

For example:

If you move it in the package hierarchy up, the date element will be visible for all rules under the new location.

If you move it in the package hierarchy down (maybe under another rule) the data element will maybe not be available for rules in which you already used it. In this case, new error markers will appear at the rule elements in which you use the moved data element.

Related Concepts.

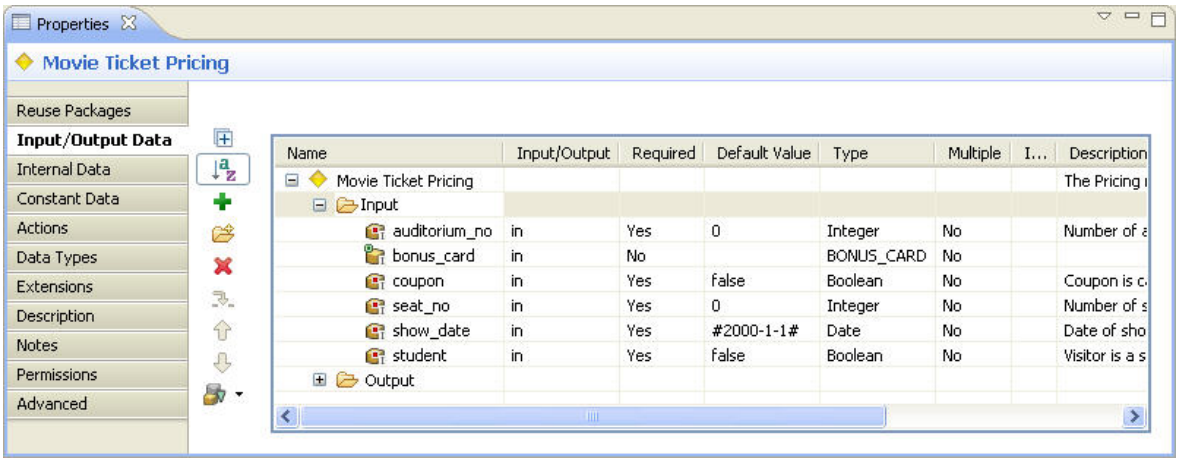
- Section 3.13, “Data” [67]

4.6.11. Sorting Data Elements Manually

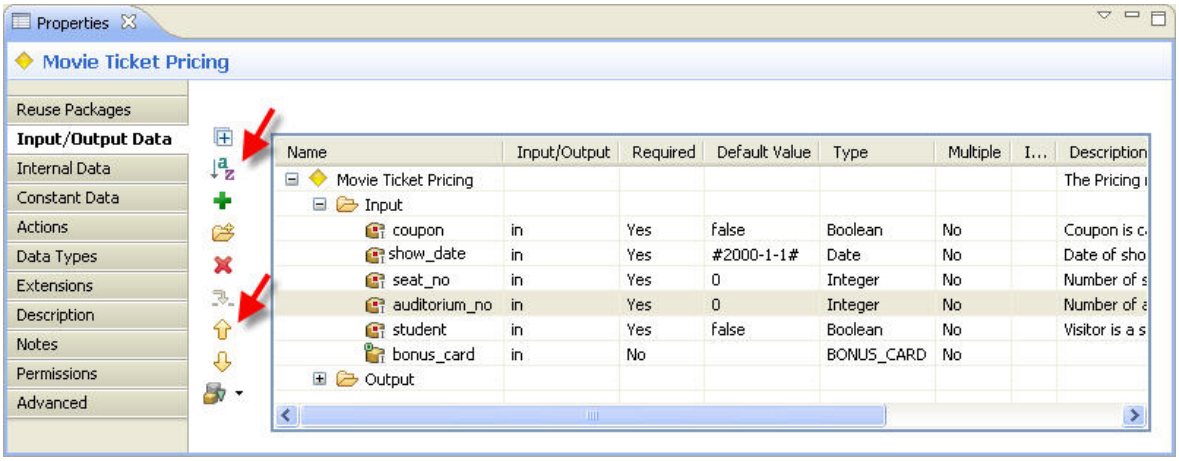
Data elements are per default displayed in alphabetical order in the **Rule Explorer**, **Project Explorer**, rule editor palette and rule test editor. You can individually turn off the automatic sorting ( ) and manually determine the order of data elements.

The following steps use input/output data elements as an example, but can be applied to other elements as well, including attributes of structures.

1. In the **Rule Explorer** or **Project Explorer**, select the rule, rule package or rule model whose data elements you want to sort.
2. In the **Properties** view, go to the **Input/Output Data** tab (or any other tab with data elements).



3. Turn off alphabetical sorting by pressing the according button ( ).



4. Select each data element that you want to reorder and use the arrow symbols (and) to move it up or down.

Related Concepts.

- Section 3.13, “Data” [67]

Related References.

- Section 5.5.1, “Rule Explorer View” [223]
- Section 5.5.2, “Project Explorer View” [223]
- Section 5.5.6, “Properties View” [226]
- Section 5.3.1.2, “Rule Context Palette” [206]

4.6.12. Renaming Data Elements

If you want to rename a data element in the **Rule Context Palette**, do the following:

1. Double-click the data element that should be renamed to open its **Properties**.
2. Replace the old name by the new one in the column **Name**.
3. Confirm the new name with **OK**.

If you want to rename a data element in the **Rule Explorer**, do the following:

1. Right-mouse click on the data element you want to rename. Select **Rename** in the context menu that appears. Alternatively, select the data item and press the **F2** key.
2. A dialog appears for you to give the data element a new name. If the name you enter is invalid or already in use, an alert message appears and **OK** is greyed out.
3. Click on **OK** to confirm the process.

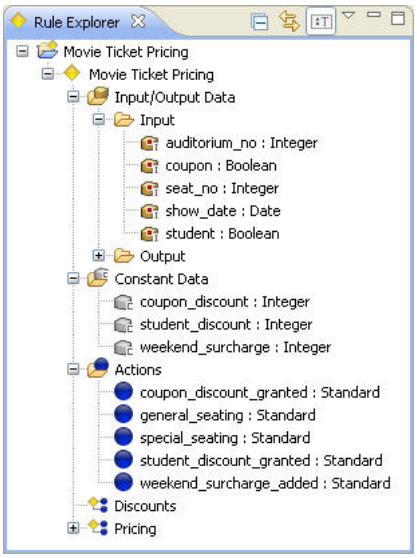
Related Concepts.

- Section 3.13, “Data” [67]

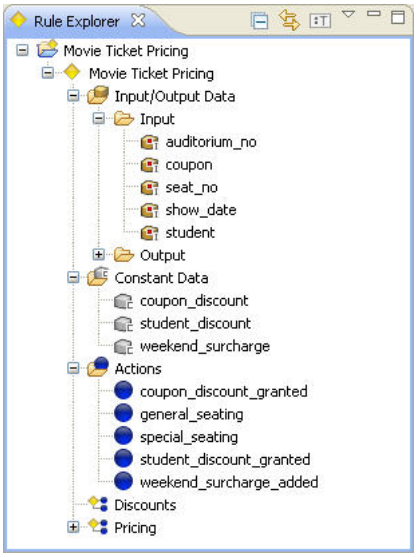
4.6.13. Displaying Data Types

On the **Rule Explorer** bar the icon Show Visual Rules Types provides detailed information for any Visual Rules item.

1. Enable this option by clicking on the ( ) icon in the **Rule Explorer**.
2. The type is now shown after the name of each item, separated by a colon. In the case of a input/output data element, for example, this is the data type. In the case of an action element, the action type is shown.



3. Deactivate this option by clicking on the ( ) icon again.



Related Concepts.

- Section 3.14, “Data Type” [71]
- Section 3.17, “Action Type” [80]

4.6.14. Creating Groups

Groups can be created in any data element and action folders. These are not important for code generation and are used only to make logical arrangements. They are not subject to the naming convention applying to other data items and they can be created more than once using the same name.

New groups are created, deleted and modified in the **Rule Explorer**. To define a new group, do the following:

1. Select the folder or the group you want to create the new group below, e.g. the Input/Ouput folder and right-mouse click on it.
2. Select **New > Group** from the contextual menu that appears.
3. A dialog appears for you to give the group a new name.
4. Click on **OK** to create the group. It appears immediately in the Rule Explorer and is already selected.

4.6.15. Deleting Groups

If you would like to delete a group, do the following:

1. Right-mouse click on the group you want to delete. Select **Delete** in the contextual menu that appears. Alternatively, you can also select the group and press the **Del** key.
2. If you would like to delete several groups at the same time, first select the ones to delete while holding down the **Ctrl** key and then select **Delete** from the contextual menu or press the **Del** key.

When you delete a group, all included items are also deleted. Make sure that you have made the right selection.

4.6.16. Editing Descriptions

You can enter descriptions for data elements, data types, attributes, literals, groups etc.

1. In the **Rule Explorer** select the element that you want to add a description to.

2. In the **Properties** view activate the **Description** tab.
3. Enter the description.

You can also specify hyperlinks to external documents within descriptions. These are automatically underlined if the protocol (e.g. **http://, resource://** or **file://**) is specified, marking them as links. Clicking on a link opens the associated application, displaying its contents.

Related Concepts.

- Section 3.15, “Description and Note” [78]

4.6.17. Editing Notes

You can enter notes for rule models, rule packages and rules.

1. In the **Rule Explorer** select a rule model, rule package or rule that you want to add the note to.
2. In the **Properties** view activate the **Notes** tab.
3. Click on the button to add a new note or click on the corresponding button to remove a note.
4. Enter the text of the note.

You can also specify hyperlinks to external documents within notes. These are automatically underlined if the protocol (e.g. **http://**, **resource://** or **file://**) is specified, marking them as links. Clicking on a link opens the associated application, displaying its contents.

Related Concepts.

- Section 3.15, “Description and Note” [78]

4.7. Working with Data Types

The following sections contain step-by-step procedures for different tasks with data types.

- Section 3.14.3, “Structure” [74]
- Section 3.14.2, “Type Alias” [74]
- Section 3.14.5, “Enumeration” [76]
- Section 3.14.6, “Exception” [76]

4.7.1. Defining Structures

In order to create a new Structure for a rule, a rule package or a rule model in the **Rule Explorer**, do the following:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define a structure.
2. Right-click the element and select **New Element > Structure** in the contextual menu that appears.
3. A dialog appears for you to give the new structure a name.
4. Click on **OK** to create the structure. It appears in the folder **Data Types** in the **Rule Explorer**.

Related Concepts.

- Section 3.14.3, “Structure” [74]

Related Tasks.

- Section 4.7.2, “Defining Attributes of a Structure” [151]

4.7.2. Defining Attributes of a Structure

To define Attributes of a structure in the **Rule Explorer**, do the following:

1. Select an existing structure to which you want to add attributes.
2. Right-click on the structure and select **New Element > Attribute** in the contextual menu that appears.
3. A dialog appears for you to give the new attribute a name.
4. Click on **OK** to create the attribute under the structure. It appears in the folder **Attributes** under the **Structure** folder in the **Rule Explorer**.
5. Insert the data element settings for the attribute.

In order to define Attributes on the **Attributes** tab in the **Properties** of the structure, do the following:

1. Click on the button to add a new attribute to the structure.
2. Insert a new name for the inserted attribute.
3. Insert the data element settings for the attribute.

For deleting an attribute, select it and click on the button.

Related Concepts.

- Section 3.14.3, “Structure” [74]

Related Tasks.

- Section 4.7.1, “Defining Structures” [150]

Related References.

- Section 5.6.8.3, “Attributes Tab” [257]

4.7.3. Defining Constants of a Structure

To define constants of a structure, do the following:

1. Select an existing structure for which you want to define constants.
2. Right-click on the structure and select **New Element > Constant Data**.
3. Enter the name of the new constant.
4. Click on **OK** to create the constant under the structure. It appears in the folder **Constant Data** under the structure in the **Rule Explorer**.
5. Insert the data element settings for the constant and insert a default value.

In order to define constants on the **Constant Data** tab in the **Properties** of the structure, do the following:

1. Click on the button to add a new constant to the structure.
2. Enter the name of the new constant.
3. Insert the data element settings for the constant and insert a default value.

For deleting a constant, select it and click on the button.

Related Concepts.

- Section 3.14.3, “Structure” [74]

Related References.

- Section 5.6.8.4, “Constant Data Tab” [258]

4.7.4. Defining Super Types of a Structure

To define the super types of a structure, do the following:

1. Select an existing structure (or exception) for which you want to set the super types.
2. Switch to the **Super Types** tab in the **Properties** view.
3. Click on the button to add a new super type to the structure.
4. Select the structure which should become a super type and click **OK**.
5. To remove a super type, select it and click on the button

A structure defined in Visual Rules can only have one super type. Structures that have been imported from a Java Type Library may have multiple super types.

Related Concepts.

- Section 3.14.3, “Structure” [74]
- Section 3.14.4, “Super Types” [75]

Related References.

- Section 5.6.8.6, “Super Types Tab” [260]

4.7.5. Defining Type Aliases

In order to create a new type alias for a rule, a rule package or a rule model in the **Rule Explorer**, do the following:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define a new type alias.
2. Right-click the element and select **New Element > Type Alias**.
3. Enter the name of the new type alias.
4. Click on **OK** to create the type alias. It appears in the folder **Data Types** in the **Rule Explorer**.
5. Select the **Primitive Type** of the alias on the **Type Alias** tab in the type alias **Properties**.

Related Concepts.

- Section 3.14.2, “Type Alias” [74]

Related References.

- Section 5.6.8.2, “Type Alias Tab” [257]

4.7.6. Defining Enumerations

In order to create a new enumeration for a rule, a rule package or a rule model in the **Rule Explorer**, do the following:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define a new enumeration.

2. Right-click the element and select **New Element > Enumeration**.
3. Enter the name of the new enumeration.
4. Click on **OK** to create the enumeration. It appears in the folder **Data Types** in the **Rule Explorer**

Related Concepts.

- Section 3.14.5, “Enumeration” [76]

Related Tasks.

- Section 4.7.7, “Defining Literals of an Enumeration” [153]

4.7.7. Defining Literals of an Enumeration

To define literals of an enumeration in the **Rule Explorer**, do the following:

1. Select an existing enumeration to which you want to add a literal.
2. Right-click on the enumeration and select **New Element > Literal**.
3. Enter the name of the new literal.
4. Click on **OK** to create the literal under the enumeration. It appears in the folder **Literals** under the enumeration in the **Rule Explorer**.
5. If you create attributes for the enumeration, you can define default values for these attributes for every literal.

In order to define literals on the **Literals** tab in the **Properties** of the enumeration, do the following:

1. Click on the button to add a new literal to the enumeration.
2. Insert a name for the inserted literal.
3. Insert a default value for the literal.
4. If you create attributes for the enumeration, you can define default values for these attributes for every literal.

For deleting a literal, select it and click on the button.

Related Concepts.

- Section 3.14.5, “Enumeration” [76]

Related Tasks.

- Section 4.7.6, “Defining Enumerations” [152]

Related References.

- Section 5.6.8.5, “Literals Tab” [260]

4.7.8. Defining Exceptions

In order to create a new exception for a rule, a rule package or a rule model in the **Rule Explorer**, do the following:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define a new exception.
2. Right-click the element and select **New Element > Exception** in the contextual menu that appears.
3. Enter the name of the new exception.

4. Click on **OK** to create the exception. It appears in the folder **Data Types** in the **Rule Explorer**.

5. If you create attributes for the exception, these can hold information about the "exceptional" situation.

Related Concepts.

- Section 3.14.6, “Exception” [76]

4.8. Working with Actions

The following sections contain step-by-step procedures how to define actions.

- Section 3.16, “Action” [79]
- Section 3.5.3, “Fire Action” [37]
- Section 3.17, “Action Type” [80]

4.8.1. Defining Actions

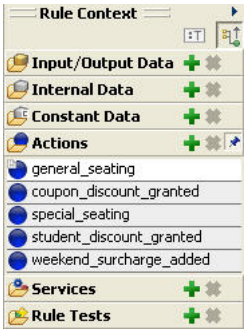
To add an action to a rule, you can simply use the **Rule Context** palette in the rule editor:

1. Click on the + button in the **Actions** section to add a new action.

2. Enter a name for the new action in the dialog that appears.

3. Press **OK**.

The action is created under the rule in which it was created and is shown in the **Rule Context** palette.



It is also displayed in the **Rule Explorer** in the **Actions** folder under the rule.

In order to create a new action for a rule, a rule package or a rule model in the **Rule Explorer**, you have two options:

Option 1:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define a new action.

2. Right-click the element and select **New Element > Action** in the contextual menu that appears.

3. A dialog appears for you to give the new action a name.

4. Click on **OK** to create the action. It appears in the folder **Actions** in the **Rule Explorer**.

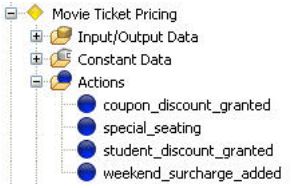
Option 2:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define a new action.

2. In the **Properties** view activate the **Actions** tab.

3. Click on the + button to add an action.

The new action is shown in the **Rule Explorer** in the **Actions** folder.



It is also displayed in the **Rule Context** of all rules in which it is available.

Related Concepts.

- Section 3.16, “Action” [79]
- Section 3.5.3, “Fire Action” [37]
- Section 3.17, “Action Type” [80]

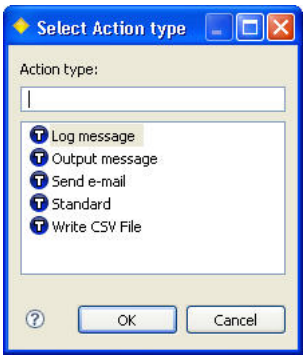
Related Tasks.

- Section 4.8.2, “Specify an Action Type for an Action” [155]
- Section 4.3.12, “Editing a Fire Action Element” [114]

4.8.2. Specify an Action Type for an Action

In order to specify an action type for an action, do the following:

1. Select an action in the **Rule Context** or in the **Rule Explorer**.
2. Open the **Properties** by double-clicking it and navigate to the **Action Settings** tab.
3. An action is per default created with **Standard** action type. If you want to use another action type use the **...** button of the **Type** field and choose an action type from the list.



4. The view of the **Action Settings** tab will change its view depending on the choosen action type.
5. Insert the action type specific settings for the action.

Related Concepts.

- Section 3.16, “Action” [79]
- Section 3.5.3, “Fire Action” [37]
- Section 3.17, “Action Type” [80]

Related Tasks.

- Section 4.3.12, “Editing a Fire Action Element” [114]
- Section 4.8.1, “Defining Actions” [154]

4.9. Working with Services

The following sections contain step-by-step procedures how to define services.

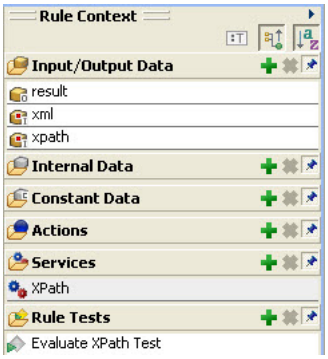
- Section 3.19, “Service” [81]
- Section 3.20, “Service Type” [82]

4.9.1. Defining Services

To add a service to a rule, you can simply use the **Rule Context** palette in the rule editor:

1. Click on the + button in the **Services** section to add a new service.
2. Enter a name for the new service in the dialog that appears.
3. Press **OK**.

The service is created under the rule in which it was created and is shown in the **Rule Context** palette.



It is also displayed in the **Rule Explorer** in the **Services** folder under the rule.

In order to create a new service for a rule, a rule package or a rule model in the **Rule Explorer**, you have two options:

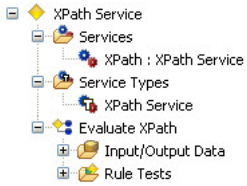
Option 1:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define a new service.
2. Right-click the element and select **New Element > Service** in the contextual menu that appears.
3. A dialog appears for you to give the new service a name.
4. Click on **OK** to create the service. It appears in the folder **Services** in the **Rule Explorer**.

Option 2:

1. Select the rule, rule package or rule model in the **Rule Explorer** where you want to define a new service.
2. In the **Properties** view activate the **Servicess** tab.
3. Click on the + button to add an action.

The new service is shown in the **Rule Explorer** in the **Services** folder.



It is also displayed in the **Rule Context** of all rules in which it is available.

Related Concepts.

- Section 3.19, “Service” [81]
- Section 3.20, “Service Type” [82]

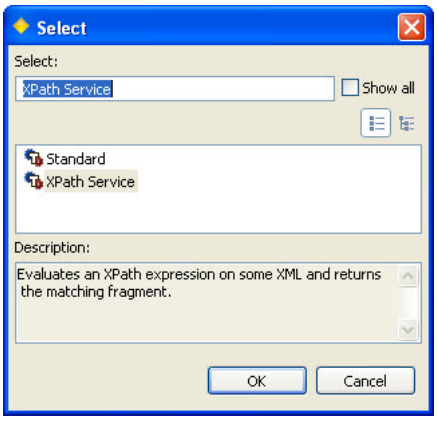
Related Tasks.

- Section 4.9.2, “Specify a Service Type for a Service” [157]

4.9.2. Specify a Service Type for a Service

In order to specify a service type for a service, do the following:

1. Select a service in the **Rule Context** or in the **Rule Explorer**.
2. Open the **Properties** by double-clicking it and navigate to the **Service Settings** tab.
3. A service is per default created with **Standard** service type. If you want to use another service type use the **...** button of the **Type** field and choose a service type from the list.



4. The view of the **Service Settings** tab will change its view depending on the choosen service type.
5. Insert the service type specific settings for the service.

Related Concepts.

- Section 3.19, “Service” [81]
- Section 3.20, “Service Type” [82]

Related Tasks.

- Section 4.9.1, “Defining Services” [156]

4.10. Working with Expressions

The following sections contain step-by-step procedures for different tasks for working with the Visual Rules Modeler.

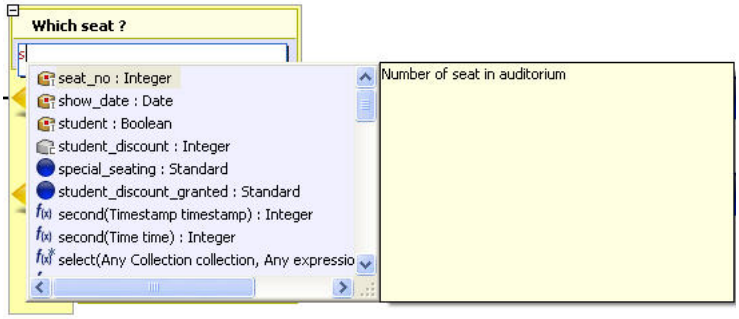
4.10.1. Using the Code Assist

Code assist helps you when entering expressions. You can activate the code assist in any field where a expression is expected as input.

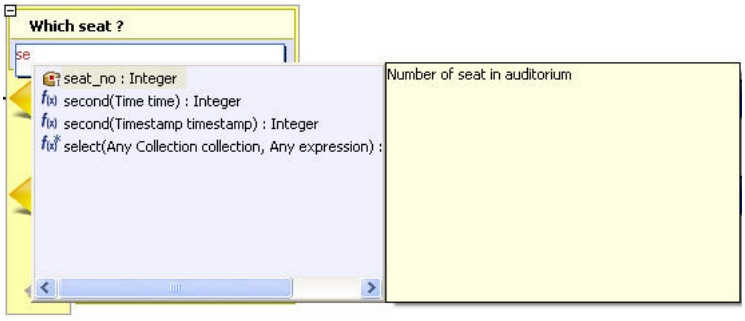
You activate code assist via the **Ctrl**+**Space** key combination.

Code assist is context sensitive and displays all available data elements, actions, functions and operators with their description at the current cursor position.

For example, if you insert the first character `s` of the searched item and then activate code assist, the following will be displayed:

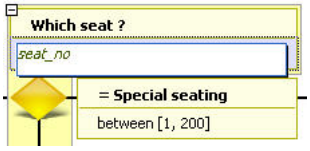


Insert a further character of the searched item, in this example an `e`. The number of code assist choices is reduced.



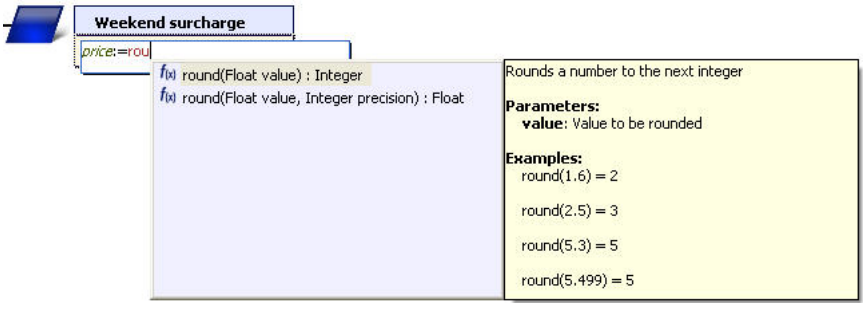
Select the searched item from the list. It is now inserted in the expression.

Code assist provides color syntax highlighting for specific, known parts of an expression (such as internal data, actions, etc.). Unknown words are not color highlighted. This is how you can recognize that the expression is faulty.



Code assist provides support for entering functions and their parameters. When selecting a function the description of the function with its function parameters are displayed automatically.

Example of code assist when using the function round(Number value):



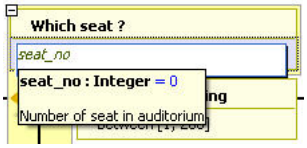
If you activate code assist (**Ctrl+Space**) without first entering characters, a list of all available data elements, functions, etc. opens up. When you now begin to type, the selection is reduced to those items beginning with the letter typed. In the example above, the code assist selection is already unique after typing two letters ("ro"). Press the **Enter** key to paste in the function round().

The function round() expects a number as its only parameter. At runtime this number is returned rounded off. If you position the cursor between the two parenthesis of the function and then activate code assist only the possible valid input/output data elements, internal data elements etc. are displayed. In this case, these are data elements that are of type Number. Anything else that is not a number may not be passed to the round() function.

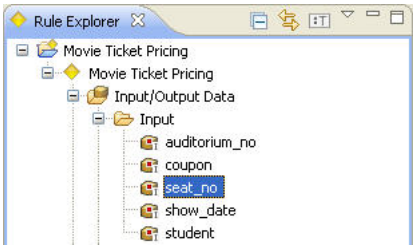
4.10.2. Hyperlinking

The data elements used in expressions are linked to the corresponding definition in the **Rule Explorer**.

You can show this link by pressing the **Ctrl** key while you are in an expression and move over a data element.



Click on the data element while holding **Ctrl** to navigate to the definition of this element in the **Rule Explorer**.

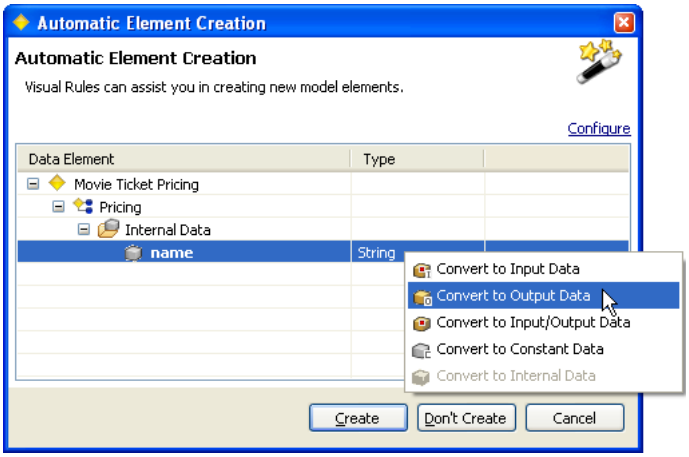


4.10.3. Working with Auto Creation

Data elements (and other elements like services, actions, rules etc.) can be created automatically via automatic element creation.

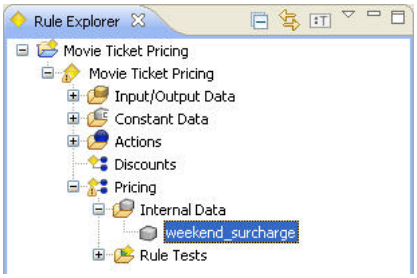
To use auto creation with expressions, do the following:

1. Insert the name of the new element in the expression of the rule element in which the new data element should be used. Use inplace editing or the **Properties** view of the rule element.
2. Leave the expression field.
3. The dialog for **Automatic Element Creation** appears.
4. Any new element appears in blue, bold font. Visual Rules tries to determine the correct data type for the new data element. If it is not able to do so, it uses the general purpose type `Any`. The type can still be edited in the second column of the table.
5. If you want to create a new element in a parent package instead of the current rule or rule package, you can drag it with the mouse to the place where it should be created.
6. If the new element is not an attribute of a data structure, you can choose to create input/output data or constant data instead of the default internal data. To do so, right-click the new element and choose the appropriate action from the context menu.



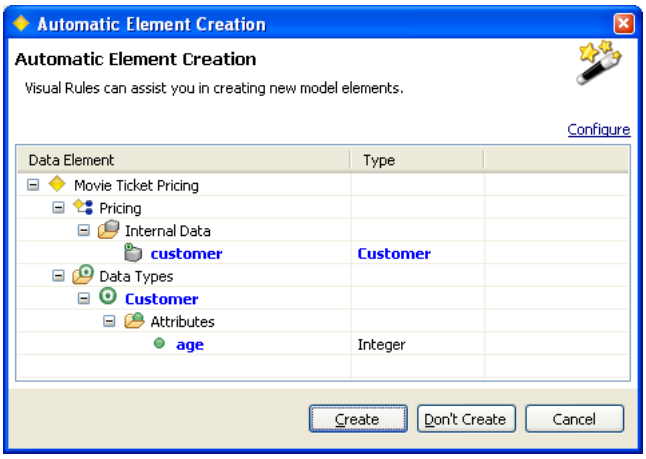
7. Confirm the creation of the new element(s) with **Create** or click **Don't Create** if you do not want the new elements to be created but the editing of the expression text should still apply. Click **Cancel** to cancel everything.

8. After confirmation, a new element can be used like any other manually created element.



9. If you access an attribute of an undefined data element in an expression, the structure can be created, too. See this example:

10. By default, a structure `Customer` with the attribute `age` is created as well as an internal data element `customer` of type `Customer`. It's still possible to change the name of the new type `Customer` to another name, like a data structure that already exists.



Auto creation also works for actions, services, flow rules and decision tables. Insert the name of the new item in the rule element that calls it and confirm the **Automatic Element Creation** dialog with **Create**.

You can select the kind of elements that you want to be created automatically **Window > Preferences... > Visual Rules > Auto Creation**

Related Concepts.

- Section 3.21, “Auto Creation” [82]

Related References.

- Section 5.4.3, “Auto Creation Dialog” [218]
- Section 5.7.3, “Auto Creation Preferences” [264]

4.11. Testing Rules

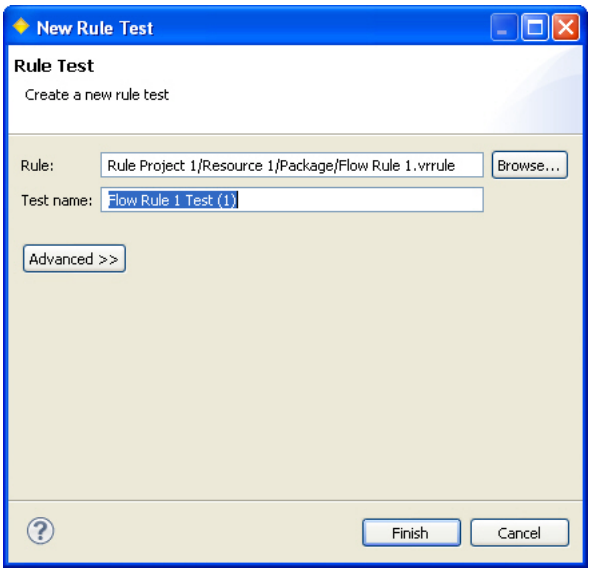
The following sections contain step-by-step procedures for different tasks you may want to perform with rule tests like the creation of a rule test or the adding of test data.

Related Concepts.

- Section 3.22, “Rule Testing” [82]

4.11.1. Creating a Rule Test

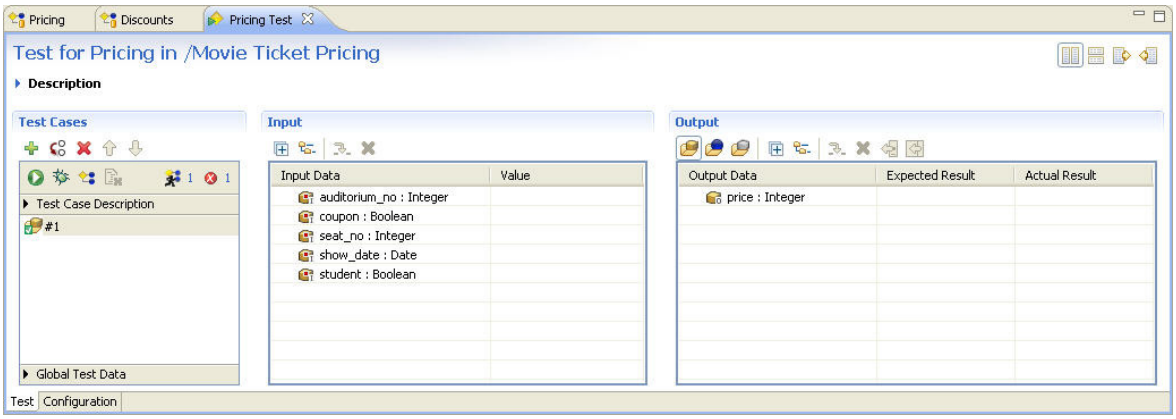
1. The fastest way to create a test for a flow rule or a decision table is to use the **Rule Context** palette. By clicking the in the **Rule Tests** section the following dialog appears:



   Alternatively, you can use also right-click on a rule and select **New Element > Rule Test** to create a new rule test.

2. After specifying a name for the new rule test click on **Finish**.

3. Now the test editor appears and you are ready to add new test cases.

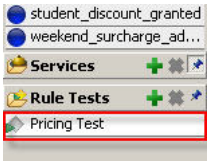


Related References.

- Section 5.3.4, “Rule Test Editor” [210]

4.11.2. Opening a Rule Test

- To open an existing rule test in the test editor you double click on the particular test in the **Rule Context** palette and the selected test will be opened in the test editor.

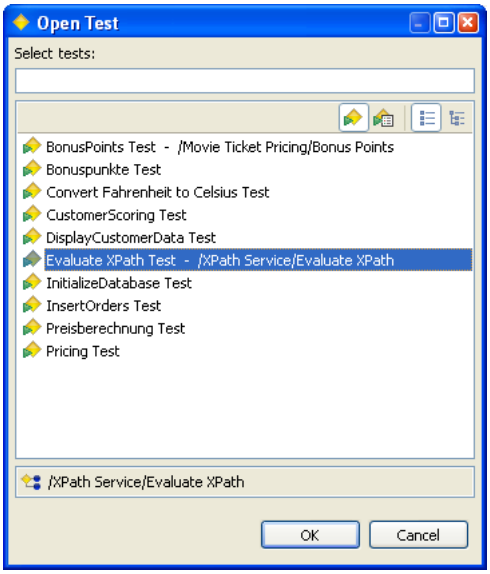


Alternatively, you can double-click a rule test in the **Project Explorer** or **Rule Explorer**.

4.11.3. Finding a Rule Test

1. To find an existing rule test (or a test suite), you use the button in the toolbar to open a short dialog for searching an existing test. This dialog lists all the rule tests in your workspace. Whenever a rule test is selected, the name of the rule being tested (including rule model name and packages) is displayed at the bottom of the list. Enter the beginning of the name of the rule test you want to open. This will filter the list so that it only shows rule tests with matching names. If nothing is entered, the list will show all rule tests. You can use an asterisk `*` to represent any number of arbitary characters, e.g. `*Score*Final` will match all tests whose name contains both the words `Score` and `Final` in that order. You can use a question mark `?` to represent exactly one character, e.g. `?Category` will match all tests whose name starts with the word `Category` preceded by exactly one character.

   The same dialog is used for finding test suites. Switching between finding test suites and finding tests is done by clicking the test suite icon or the rule test icon in the dialog's action bar.



4.11.4. Copying a Test

You can copy a test from one rule into another. If so, the latter will be subject to the copy.

1. Copying a test is done with drag&drop. Select the test you want to copy, click on it and hold down the left mouse button.
2. Drag the test to the rule you want to be tested. Press and hold the **Ctrl** key to create a copy.
3. Let go of the mouse button to paste the copy.

If the **Ctrl** key is not held down when you release the mouse button, the test is not copied to the new rule, but moved.

Related Concepts.

- Section 3.22.1, “Rule Test” [83]

Related Tasks.

- Section 4.11.5, “Moving a Test from one Rule to another” [163]

4.11.5. Moving a Test from one Rule to another

You can move a test from one rule into another. If so, the latter will be subject to the test.

1. Moving a test from one rule to another rule is done with drag&drop. Select the test you want to move, click it and hold down the left mouse button.
2. Drag the test to the rule you want to be tested.
3. Let go of the mouse button to move the test.

If you want to create a copy of the test, press and hold the **Ctrl** key when you release the mouse button.

Related Concepts.

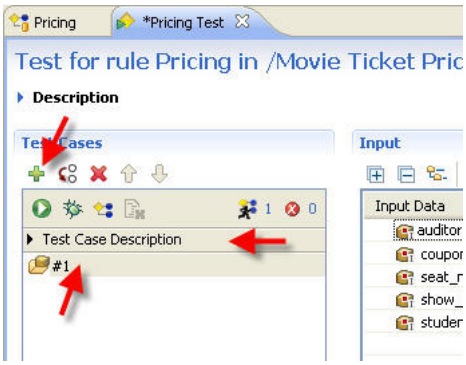
- Section 3.22.1, “Rule Test” [83]

Related Tasks.

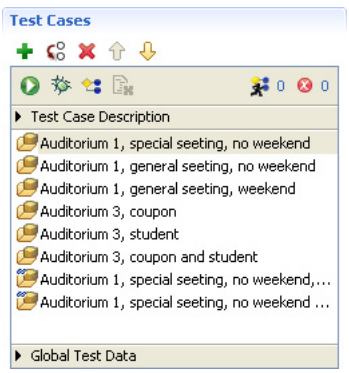
- Section 4.11.4, “Copying a Test” [162]

4.11.6. Adding Test Cases

1. After you have created a new test, the test editor already has generated a test case (**#1**). It is recommended to give each test case a specific name and description. Both can be done using the inplace editing in the **Test Cases** table.
2. To create additional test cases click on the + at top of the table.



The icon of a test case is decorated with small glasses when the test case has a description. This way it is easier to see which test cases have descriptions (see the last two test cases in the image below).


Test Cases
Test Case Description
Auditorium 1, special seeting, no weekend
Auditorium 1, general seeting, no weekend
Auditorium 1, general seeting, weekend
Auditorium 3, coupon
Auditorium 3, student
Auditorium 3, coupon and student
Auditorium 1, special seeting, no weekend,...
Auditorium 1, special seeting, no weekend ...
Global Test Data

Related Tasks.

- Section 4.11.7, “Importing Test Cases” [164]

4.11.7. Importing Test Cases

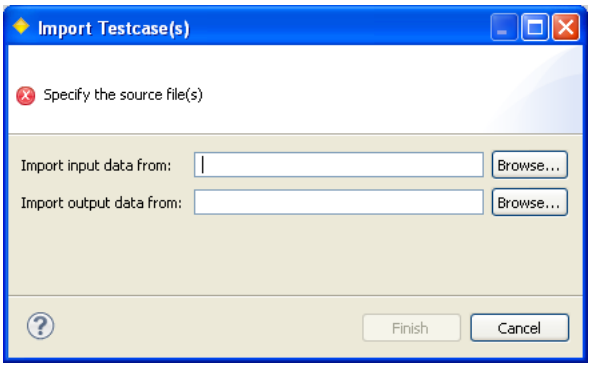
Test cases can be imported from XML. This is really useful in conjunction with automated saving of request data for a rule call. It's possible to let the end user of your application press a button in order to save his data to a file that can be sent to the modelers. This file can be imported into the test editor, resulting in the creation of new test cases.

For technical details concerning the saving of the rule request data, consult the section *Saving Request Data* in the *Java Integration Guide*.

In order to import test cases from an XML file, execute the following steps:

1. Click the icon.
2. In the dialog that opens, specify the relevant source files, i.e. both the file to import the input data and the file to import the output data from. If the file extension is not the usual `vrdata`, you have to change the file filter.

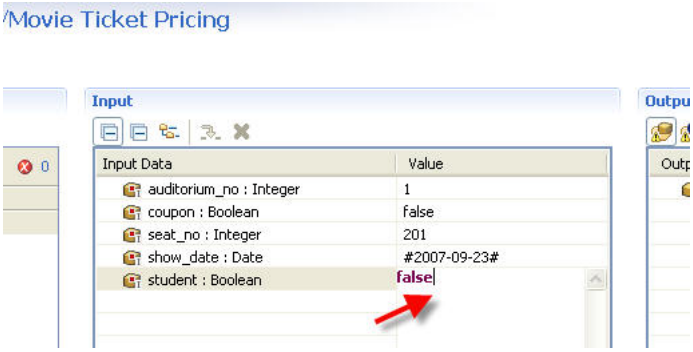
Input and output data may be imported from the same file.



Now from every rule call saved in the file, a test case has been created. If the file contains input data that does not fit to the rule, it will still be visible in the test case, but error markers will have been created for it.

4.11.8. Entering Test Data

On the **Input** section of the test editor you can now enter your data for every single input defined for the rule. For this, double-click on the value field for the data element you want to edit.



Related Tasks.

- Section 4.11.9, “Copying and pasting values” [164]

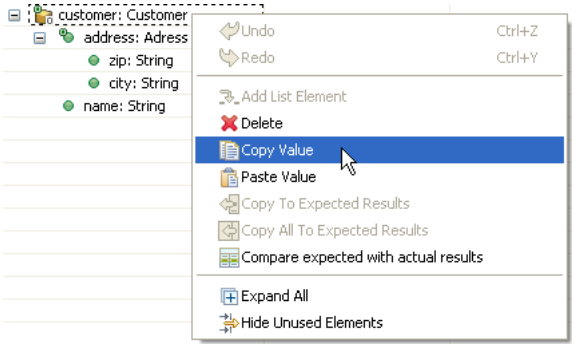
4.11.9. Copying and pasting values

In many places in the user interface, values of data elements displayed in cells can be copied and pasted to cells of corresponding type. The copied value can have a complex structure consisting of many attribute and list values.

Because all values are copied with a single click, this can significantly reduce the amount of work, especially for editing test data.

In order to copy a value from one cell to another, perform the following steps:

1. Select the cell containing the value to copy.
2. Press `Ctrl-C` or select the **Copy Value** command from the context menu.



3. Select the cell to copy the value to.
4. Press `Ctrl-V` or select the **Paste Value** command from the context menu.

Alternatively, you can use the mouse to drag a value from one cell to another. Usually the value will be moved. By pressing the `Ctrl` key while dropping the value, it will be copied instead.

4.11.10. Enabling/Disabling Test Cases

Test cases can be disabled. When the test is executed, disabled test cases will be skipped. This helps to speed up testing while you want to concentrate on one or several specific test case.

1. Select one or multiple test cases (you can select multiple test cases by holding the Ctrl key).
2. Right-click on the selected test case(s).
3. From the context menu select the option **Disable Test Cases**. This will disable the test cases and they are greyed out.
4. In order to reenable test cases, right-click on it and select **Enable Test Cases**.

   You can also choose the menu entries to enable/disable not the selected test cases, but all others. This way you can for example easily disable all test cases except one.

4.11.11. Duplicating Test Cases

To duplicate an existing test case, do the following:

1. Select the test case you want to duplicate and click the button. A copy of the selected test case appears in the list.
2. Once again it's recommended to rename the test case and enter a specific description.

4.11.12. Deleting Test Cases

1. Select the test case you want to remove.
2. Click the button.

4.11.13. Reordering Test Cases

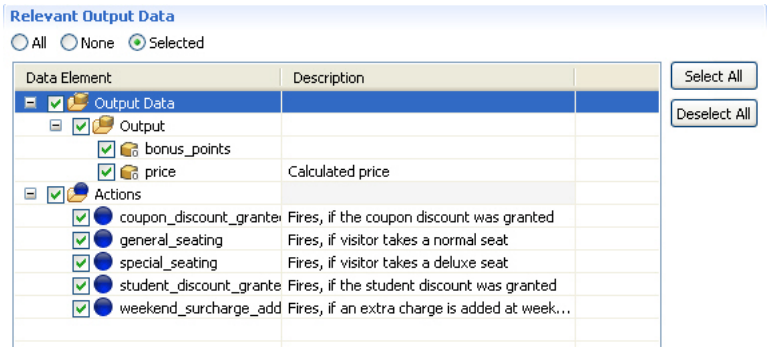
1. If you want to reorder your test cases you do this by selecting the particular test case in the list.

2. Use the and buttons to send the test case to the right position in the list.

4.11.14. Selecting the relevant Output Data

1. To select the data elements, for which results should be considered in the test, you have to switch to the **Configuration** tab of the test editor.

2. In the **Relevant Output Data** section you have the possibility to de/select either all or every single data element separately or use the **Select All** and **Deselect All** buttons.

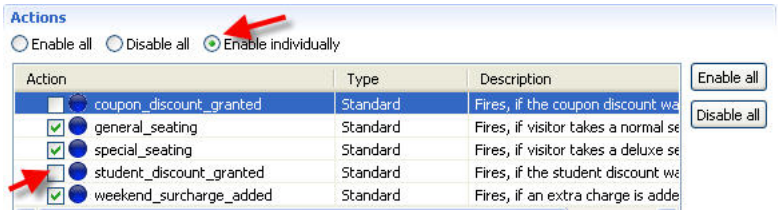


4.11.15. Enabling/Disabling Actions

1. In some cases it might be useful to prevent certain actions from being executed during a test run. They are "fired" and you can list them as a result in the test editor but the action that is not executed. An example for this are "Send email" actions, for test you don´t want to send an email for every test execution and just want the information that an email would had been send.

2. This can be done by switching to the configuration tab of the test editor.

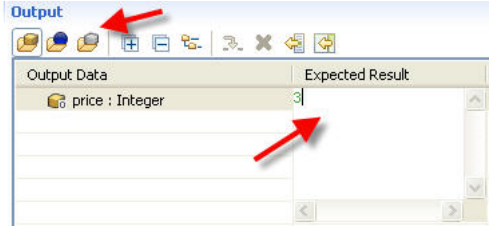
3. At the **Actions** section you have the possibility to en/disable all actions at once or use the checkboxes to en/disable particular actions separately.



4.11.16. Defining Expected Results

1. On the **Output** section the test editor displays all output parameters defined in the settings on the configuration tab.

2. By double-clicking on the **Expected Result** field in the **Output** section of the test editor you may enter your expected result for the particular output data element.



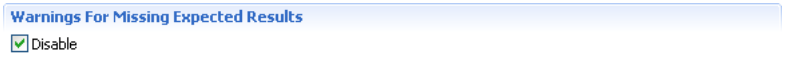
Each category of results is represented by a separate tab on top of the **Output** section. By clicking on the symbols you can switch between viewing the result for **Output Data**, **Actions** or **Internal Data**.

Related Tasks.

- Section 4.11.9, “Copying and pasting values” [164]

4.11.17. Disabling Warnings for Missing Expected Results

Visual Rules usually creates small warning markers for output data that does not have an expected result set. This can be disabled for a rule test by checking **Disable** in the section **Warnings For Missing Expected Results** of the configuration tab.



4.11.18. Defining Expected Exceptions

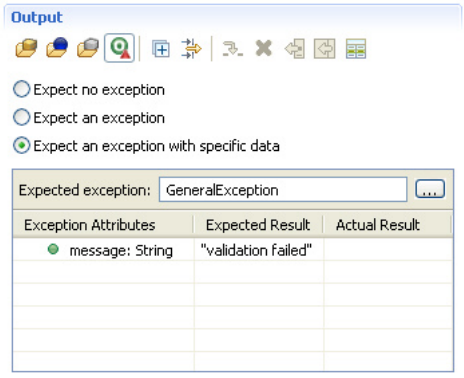
If a rule returns an exception, this is usually considered a test failure. However, it is possible to specify the exception as the "expected" result and the test to succeed if and only if the exception was returned.

1. Click the icon in the test editor (**Output** section) to specify the exception.
2. Select an option:

   Expect no exception
   : This is the default and will cause the test case to succeed only if no exception is returned.

   Expect an exception
   : This will cause the test case to succeed only if an exception is returned and the exception is of the given type.

   Expect an exception with specific data
   : This will cause the test case to succeed only if an exception is returned and the exception if of the given type and all attributes have the given expected values.
3. In the **Expected exception** field specify the exception type. You can use **...** to browse the existing exception types.
4. Optionally specify expected values for the attributes of the exception. This is only possible if you selected the third option above.



4.11.19. Executing a Test

When executing a test, a corresponding result file with the same name is automatically generated. It is represented by the icon and added to the test in the rule explorer.

1. After you have entered all required test input data and the related expected results, click on the button to run the rule test.

2. During execution all system messages like execution time are displayed on the **Console** at the bottom of the screen.

4.11.20. Showing Results for a specific Execution of a Test

A test might have been executed individually or in the course of executing a test suite. At each time, a corresponding result file (represented by the icon) has been added to the test or to the relevant test suite in the rule explorer.

To show the results of a specific execution of a test, do the following:

1. Double-click on the corresponding result file in the rule explorer.

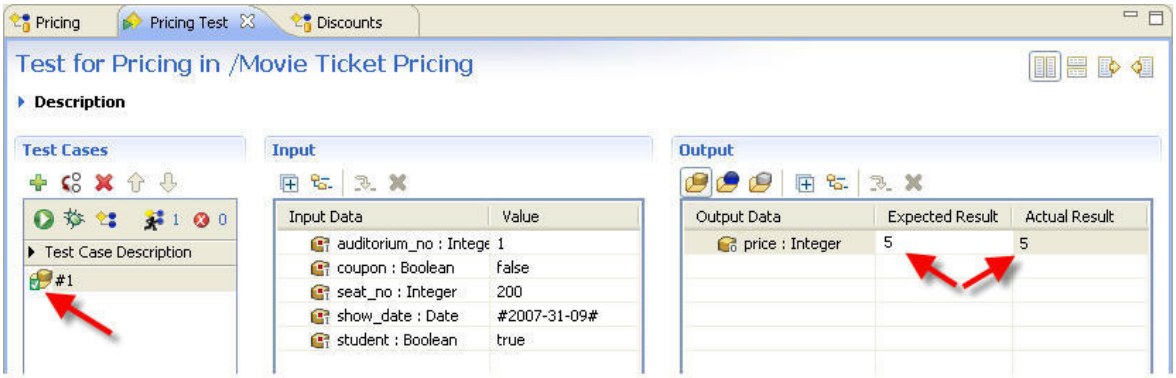
2. Double-click on the relevant test in the test suite editor, if necessary.

   The test editor opens with respect to the relevant test and result file.

4.11.21. Inspecting Results

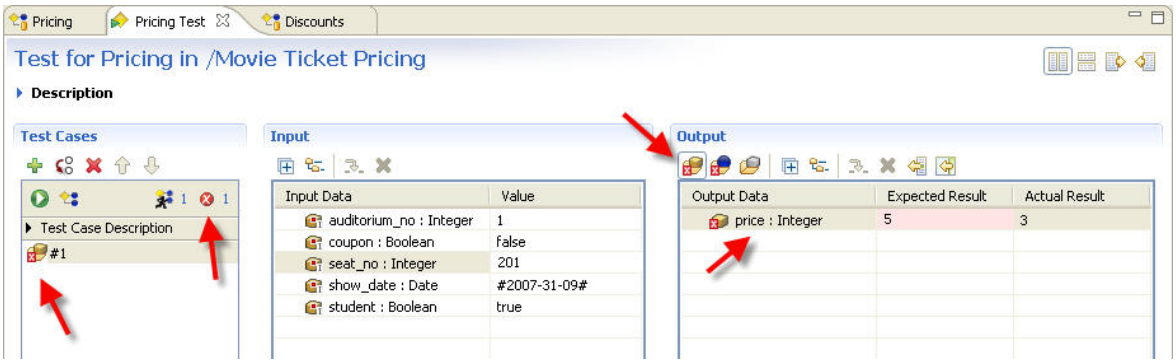
The results shown in the test editor always correspond to a specific execution of the respective test. To show the relevant result file in the rule explorer, click on the icon in the test suite editor.

1. After running your test you can check if the test was successful. This is indicated by the symbol in the **Test Cases** section and tells you, that the rule logic related to the test case was correct and the expected results match the actual values.



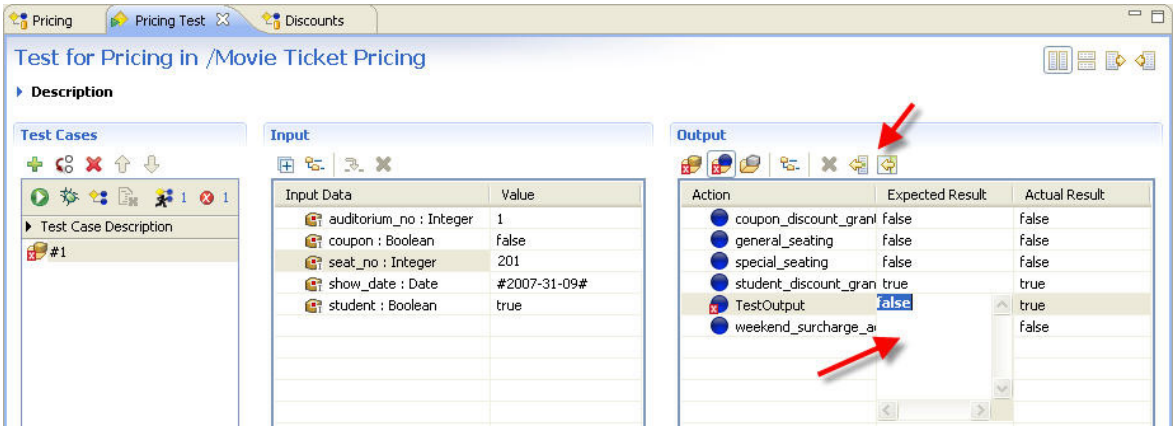
2. In case the test fails this is indicated by the symbol in the **Test Cases** and **Output** sections. A test fails if the expected results don't match with the actual results. This can happen if there is a problem in the rule logic or there are wrong values in the expected results.

   You may also get a warning symbol indicating that the rule has produced results for which no expected result was specified.

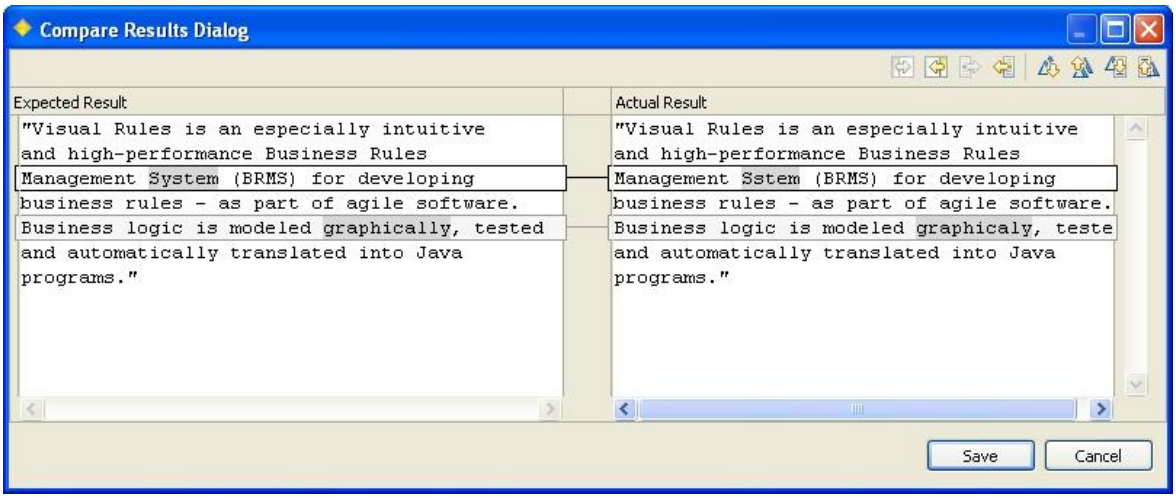


3. Please make sure you also check the other outputs (actions, internal data) for failures. The view can be switched with the buttons at the top of the **Output** section.

4. In case you want to update your expected result with the latest actual results you can use the inplace editing or the copy buttons on the top panel of the **Output** section.

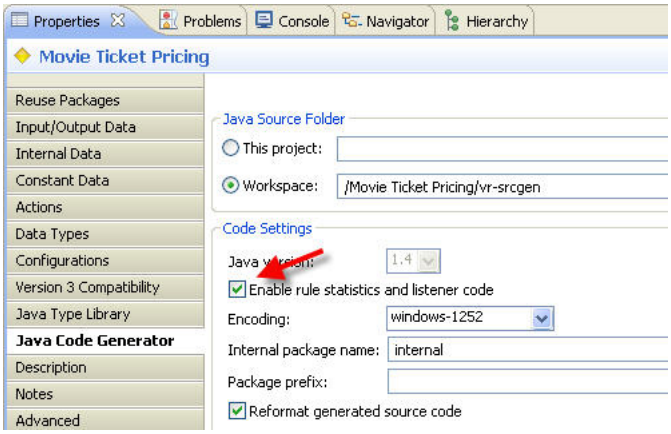


You can also use the **Compare Results Dialog** to compare the expected and actual result. This dialog is especially useful when comparing large strings, since it highlights the spots where the differences are. In order to open the **Compare Results Dialog**, select one of the outputs and click on the **Compare expected with actual result** button ( ). In this dialog, you can also copy the actual result to the expected result ( ). Additionally you can navigate through the individual deviations with the navigation buttons ( ) and copy these to the expected result ( ).

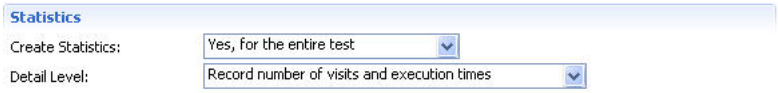

Compare Results Dialog
Expected Result
"Visual Rules is an especially intuitive
and high-performance Business Rules
Management System (BRMS) for developing
business rules - as part of agile software.
Business logic is modeled graphically, tested
and automatically translated into Java
programs."
Actual Result
"Visual Rules is an especially intuitive
and high-performance Business Rules
Management Sstem (BRMS) for developing
business rules - as part of agile software.
Business logic is modeled graphicaly, teste
and automatically translated into Java
programs."
Save
Cancel

4.11.22. Creating and Configuring Statistics

1. Before you start configuring your rule statistics in the test editor, make sure that the rule code generator settings enabled rule statistics. You can check that on the **Java Code Generator** tab of the rule project.

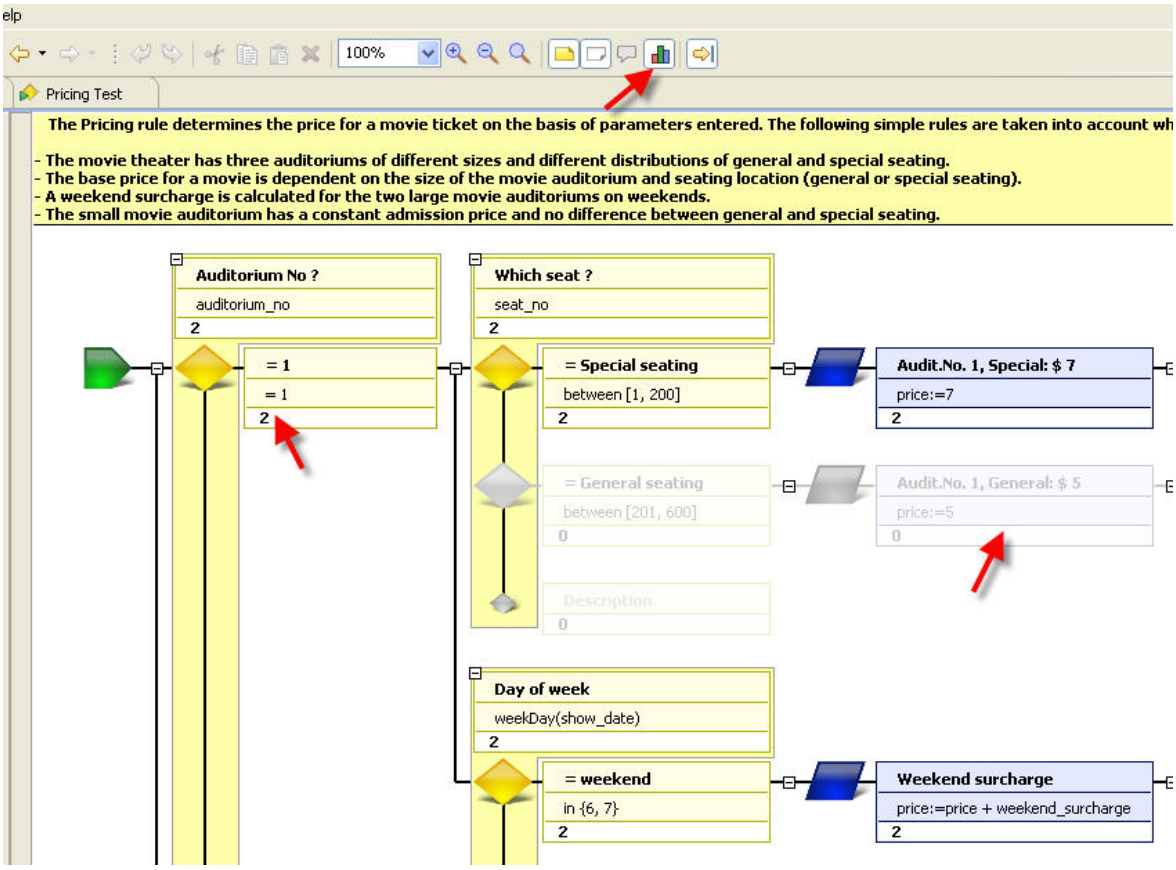


2. On the **Configuration** tab of the test editor you have further options to tune your statistics. In the select box **Create Statistics** you can select whether you want the statistic being generated for the entire test or for every test case of your rule test separately. If you select **Yes, for every test case** then you can show the statistics for a single test case that is selected in the test editor.



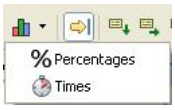
3. To define the detail level of your statistics you can choose to either record the number of visits or to record both the number of visits and the execution times.

4. To see the current statistics for your test you have to open the related rule or decision table in the editor after you run your test. Make sure you have activated the statistics view by clicking on the icon.

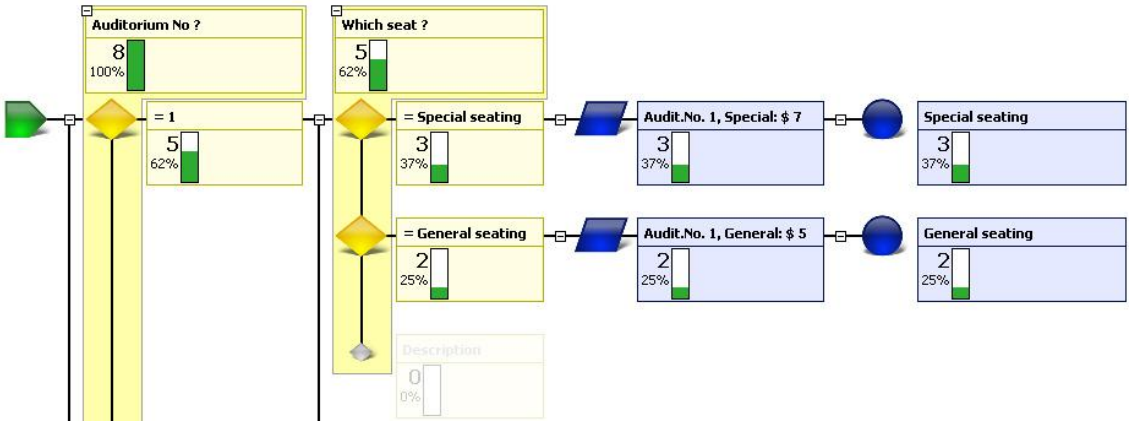

100%
Pricing Test
The Pricing rule determines the price for a movie ticket on the basis of parameters entered. The following simple rules are taken into account wh
- The movie theater has three auditoriums of different sizes and different distributions of general and special seating.
- The base price for a movie is dependent on the size of the movie auditorium and seating location (general or special seating).
- A weekend surcharge is calculated for the two large movie auditoriums on weekends.
- The small movie auditorium has a constant admission price and no difference between general and special seating.
Auditorium No ?
auditorium_no
2
= 1
= 1
2
Which seat ?
seat_no
2
= Special seating
between [1, 200]
2
Audit.No. 1, Special: $ 7
price:=7
2
= General seating
between [201, 600]
0
Audit.No. 1, General: $ 5
price:=5
0
Description
0
Day of week
weekDay(show_date)
2
= weekend
in {6, 7}
2
Weekend surcharge
price:=price + weekend_surcharge
2

5. You can see now an additional box next to each rule element which tells you how many times this element was passed during your last test run. Elements which were not passed are displayed in grey.

6. You can change the display of statistics with the drop-down menu from the toolbar.



For example, the following picture includes the display of percentages.



Related Concepts.

- Section 3.22.3, “Statistics” [84]

4.11.23. Selecting a Configuration for the Rule Execution

In order to select the configuration for the rule execution, do the following:

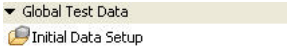
1. Open the **Configuration** tab of the test editor.
2. In the drop down field **Configuration for Rule Execution** you can select a configuration for the rule execution. By default there exists just the Standard configuration but for example there could be a customer specific configurations for test or production.

Configurations for the rule execution are created by the technical experts. Please contact your technical expert to get information about your configurations.

4.11.24. Initializing Static Internal Data Elements

In order to define values of static internal data elements for the rule test, do the following:

1. Open the **Global Test Data** area on the **Test** tab of the test editor.



2. Click on **Initial Data Setup** to open the view for editing values of static internal data.
3. All internal data elements that are defined as static are shown. Insert values for these elements in the column **Value**. The internal data elements are initialized with these values at the beginning of the rule execution and keep the values over the execution of test cases.

An internal data element that you have defined as static, inserted initial values for it and afterwards redefined it as non static, is still displayed with its values in the **Initial Data Setup** view. If you define it as static again the initial values defined before are still available. If you really want to delete the internal data element from the **Initial Data Setup** you have to delete it manually

4.12. Organizing Rule Tests in Test Suites

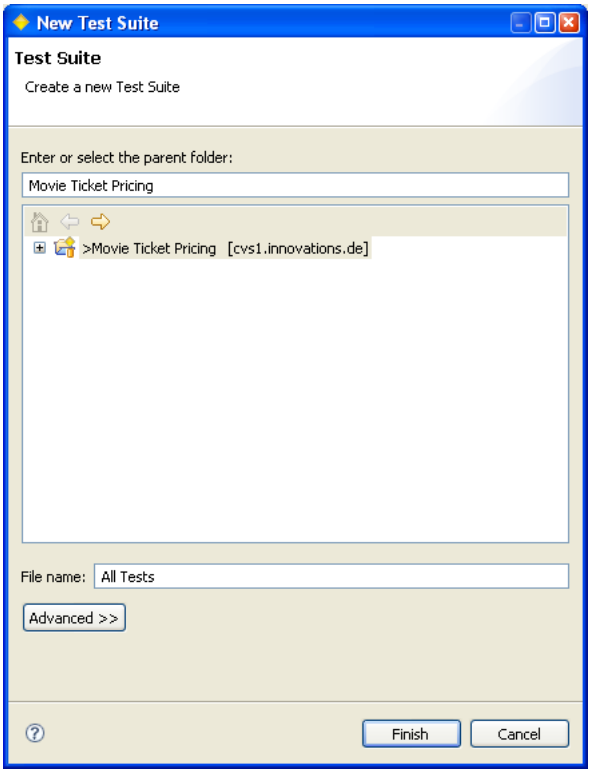
The following sections contain step-by-step procedures for creating, editing and running test suites.

Related Concepts.

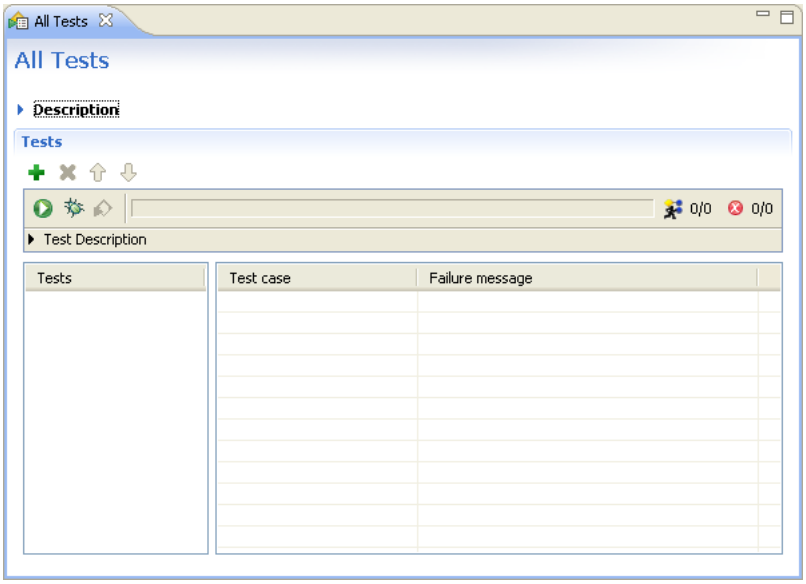
- Section 3.22, “Rule Testing” [82]

4.12.1. Creating a Test Suite

1. Right-click on a rule project or a subfolder thereof in the **Rule Explorer** or **Project Explorer**.
2. Select the item **New > Test Suite** from the context menu.
3. The **New Test Suite** wizard appears.



4. Enter the name of the new test suite and click **Finish**. It's possible but not recommended to change the folder where the file is created.
5. Now the test suite editor appears and you are ready to add rule tests or other test suites to the new test suite.



Related References.

- Section 5.3.5, “Test Suite Editor” [213]

4.12.2. Opening or Finding a Test Suite

You can use the following methods to open an existing test suite.

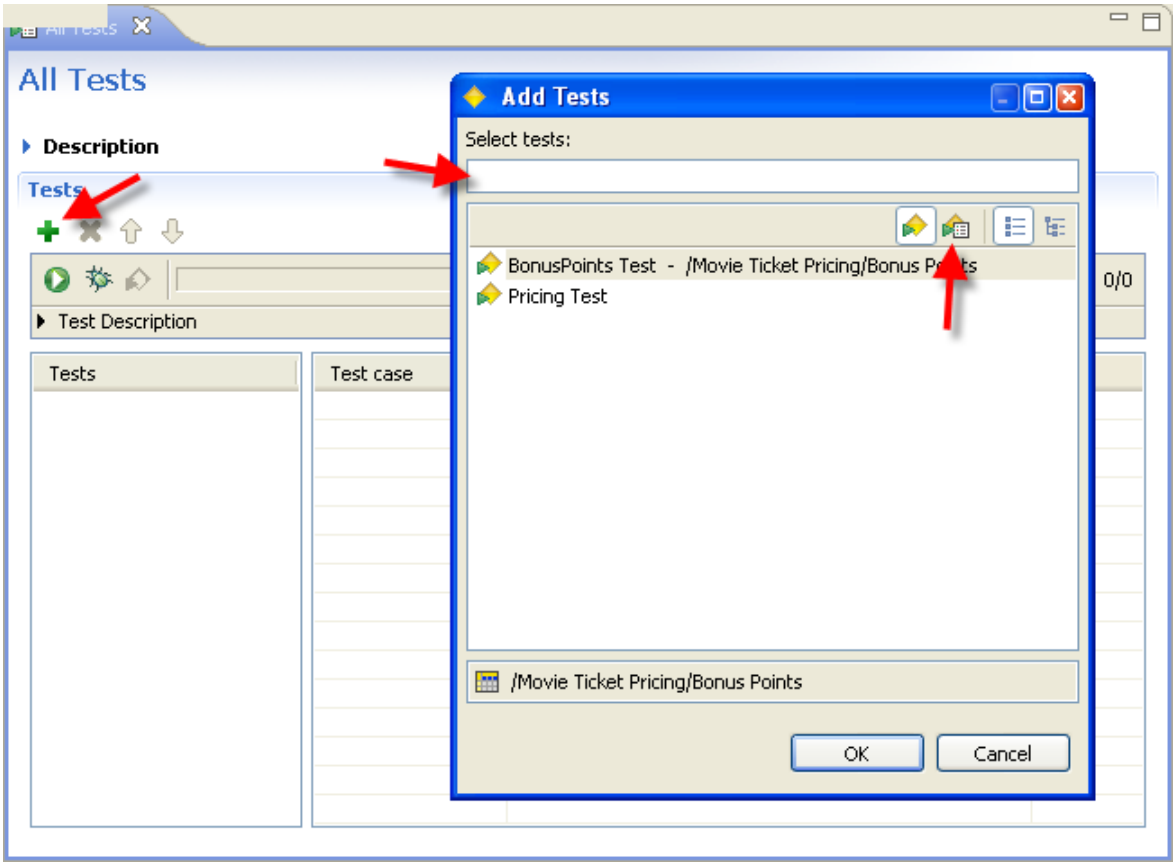
- Double-click the test suite in the **Project Explorer** or **Rule Explorer** if you know its location.
- Use the Open Rule Test dialog:

1. Click the button in the toolbar.
2. In the dialog that opens, click the button to show test suites.
3. As described for rule tests in Section 4.11.3, “Finding a Rule Test” [162], you can type the first letters of the test suite's name and then double click the corresponding list item.

4.12.3. Adding Tests

The purpose of a test suite is to group related rule tests and other test suites so that they can be executed together. Here is how to add tests to a test suite:

1. Click the add icon in the test suite editor.
2. A dialog opens and initially displays all rule tests in the workspace.



3. Optionally you can click the button to display test suites.
4. Optionally you can type the first letters of the test to add. This filters the tests being displayed.
5. Select all tests to add and press **OK**.

A rule test can be added to any number of test suites or to no test suite at all.

4.12.4. Removing Tests

Removing a test from a test suite does not delete the test. It simply means that the test will no longer be executed with the suite.

1. Select all tests you want to remove in the test suite editor.
2. Click the button either in the test suite editor's tool bar or in the context menu.

Only tests that are directly included in the edited test suite can be removed this way. If you want to remove tests that are part of a test suite in the test suite, you have to open the nested test suite in another editor (by double clicking it) and remove the test in this editor.

4.12.5. Executing a Test Suite

Execution of a test suite means the sequential execution of all included tests.

When executing a test suite, a corresponding result file with the same name is automatically generated. It is represented by the icon and added to the test suite in the rule explorer.

- Click the button in the test suite editor to execute all tests included in the suite.

Each test is selected in the tree view during its execution. If a test fails, then the selection does not change any more. Failures are shown in the table on the right side of the editor. In order to retrieve more information about the failures, a test can be opened in its editor by double clicking it.

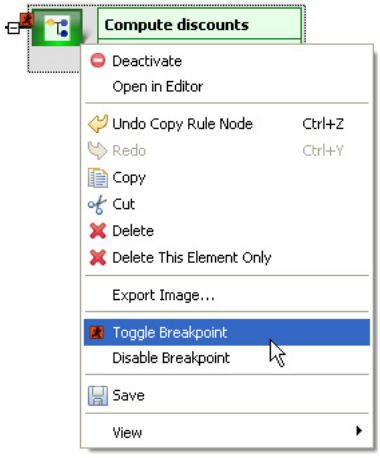
4.13. Debugging Rules

The following sections contain step-by-step procedures related to rule debugging.

4.13.1. Setting Breakpoints

Breakpoints define the locations in rules where execution should halt during debugging.

1. Right-click a rule element in a flow rule or a cell in a decision table where you want to set a breakpoint.
2. Select the **Toggle Breakpoint** menu entry from the context menu. This will create a breakpoint (or remove an already existing breakpoint).



3. The breakpoint icon ( ) appears next to the rule element or decision table cell.
4. Existing breakpoints can be disabled with the **Disable Breakpoint** entry from the context menu. A disabled breakpoint has a white icon ( ).
5. Disabled breakpoints can be reenabled using the **Enable Breakpoint** menu entry.

Visual Rules provides a **Breakpoints** view that lists all existing breakpoints. The view is part of the **Debug** perspective, but can also be opened elsewhere with **Window > Show View > Other...**. Select the **Breakpoints** view from the list and click **OK**.

Related Concepts.

- Section 3.23.2, “Breakpoint” [88]

Related Tasks.

- Section 4.13.3, “Stepping Through Rules” [176]

Related References.

- Section 5.5.10, “Breakpoints View” [229]

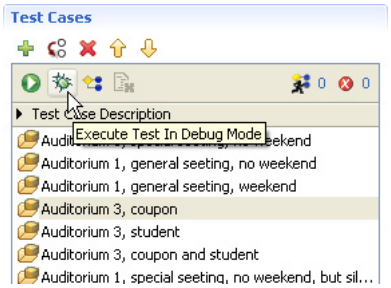
4.13.2. Debugging a Rule Test

In order to execute a rule test in the debugger, do the following:

1. Open the rule test in the rule test editor.

2. Set a breakpoint at the desired location where you want rule execution to halt. If you want to halt right at the beginning, you should set the breakpoint on the start element of the rule being tested.

3. Start the debugger by clicking on the **Debug** ( ) button shown above the list of test cases.


Test Cases
Execute Test In Debug Mode
Auditorium 1, general seeting, no weekend
Auditorium 1, general seeting, weekend
Auditorium 3, coupon
Auditorium 3, student
Auditorium 3, coupon and student

4. Once execution hits the breakpoint, Visual Rules switches to the **Debug** perspective that lets you step through the rules (see Section 4.13.3, “Stepping Through Rules” [176]).

Related Concepts.

- Section 3.22.1, “Rule Test” [83]
- Section 3.22.2, “Rule Test Editor” [83]
- Section 3.23.1, “Debugger” [87]
- Section 3.23.2, “Breakpoint” [88]

Related Tasks.

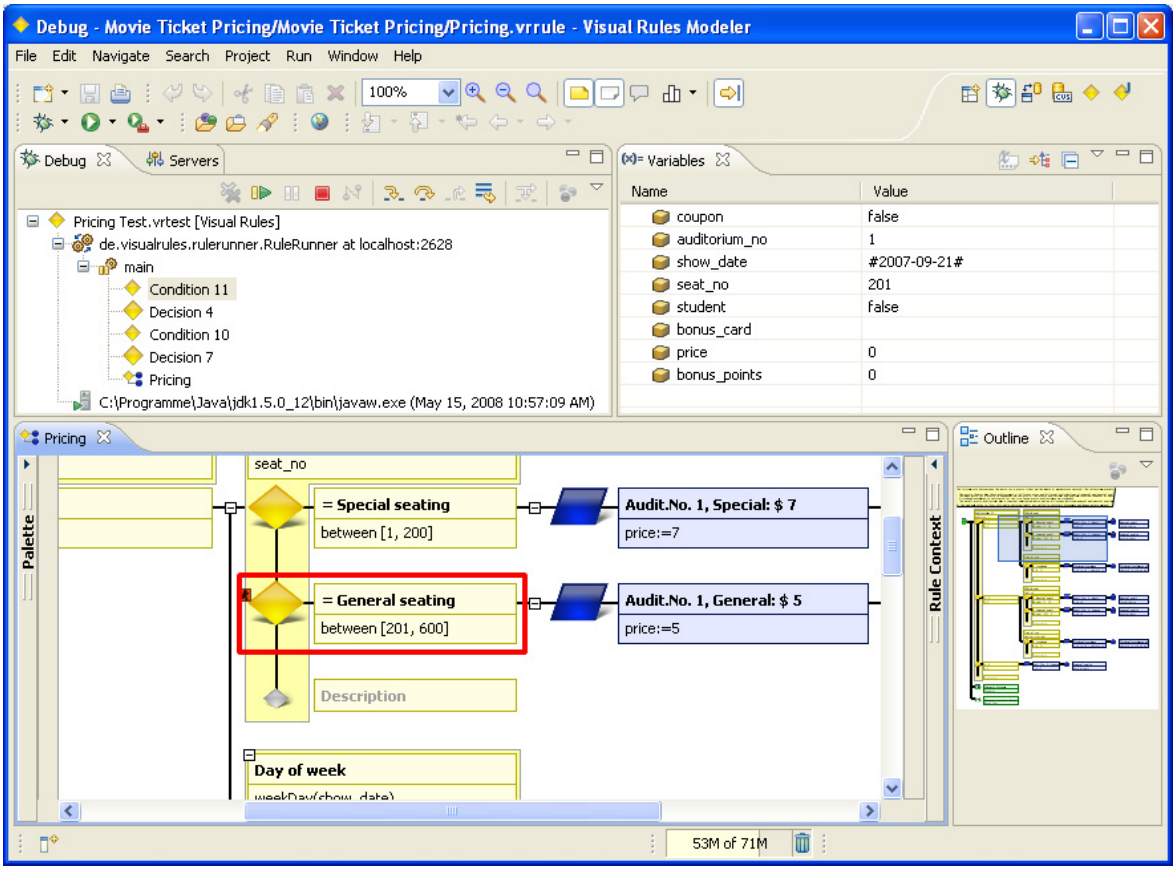
- Section 4.13.1, “Setting Breakpoints” [175]
- Section 4.13.3, “Stepping Through Rules” [176]

Related References.

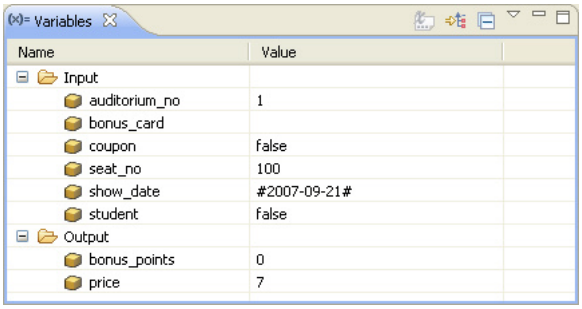
- Section 5.5.10, “Breakpoints View” [229]

4.13.3. Stepping Through Rules

1. When rule execution reaches a breakpoint during a debug session, Visual Rules Modeler will switch to the **Debug** perspective and show the current position in the flow rule editor or the decision table editor.



2. The **Variables** view allows you to inspect the current values of the data elements.



3. The **Debug** view displays a list of the rules and rule elements that have been visited so far. The buttons in the view toolbar are used to control the debug session. Most buttons also have a function key shortcut.

   Press the **F5** key ( ) to step forward from one rule element to the next.

   Press the **F6** key ( ) to step over the remaining elements in a rule branch and then halt again.

   Press the **F8** key ( ) to resume execution until it hits another breakpoint.

4. If you don't want to continue debugging, click on **Terminate** ( ). This will immediately terminate rule execution and the debug session.

5. If you are debugging remotely, you can use **Disconnect** ( ) to end the debug session and resume normal execution of the rules.

Related Concepts.

- Section 3.23.2, “Breakpoint” [88]
- Section 3.6, “Flow Rule Editor” [45]

- Section 3.8, “Decision Table Editor” [50]

Related References.

- Section 5.5.8, “Debug View” [227]
- Section 5.5.9, “Variables View” [228]

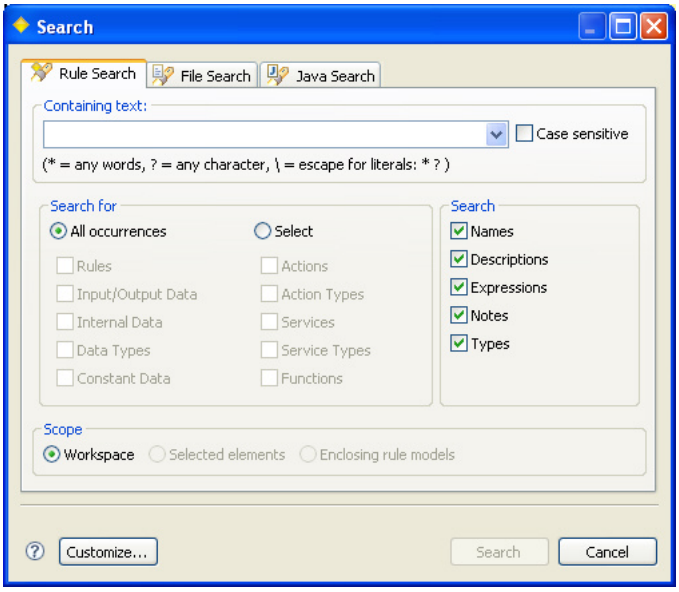
4.14. Searching Rule Models

Visual Rules allows you to search for individual data elements, actions, data types etc. This can be helpful, for example, for finding every occurrence of an input/output data element in a rule model.

4.14.1. Searching Elements

To search elements in rule models use the **Search** view and do the following:

1. Select **Search** > **Search** from the menu. Alternatively, you can use the **Ctrl**+**H** key combination.
2. Select the **Rule Search** tab in the dialog that appears.



3. Enter the text you want to find in the **Containing text** field.

You can also use wildcard characters to increase the number of matches. Use * as the wildcard for any string or ? to represent any character. To search explicitly for the * or ? characters, you have to quote them using the \ character, e.g. * is used to search for an asterisk.

4. You can select **Case sensitive** if you want to search for text with notice of upper and lower cases.
5. In the **Search for** box, you can select the kinds of elements to search for.
6. The options in the **Search** box determine where the text must be found. You can search in **Names**, **Descriptions**, **Expressions** and **Notes**.
7. Select the scope to be searched.

   Select **Workspace** to search in all rule models in the workspace.

   Select **Selected elements** to search in those rule models, rule packages or rules that you have selected before opening the search dialog.

   Select **Enclosing rule models** to search in those rule models in which at least one element was selected.

8. Finally, click on **Search** to start the search. The **Search** view appears automatically. The search now runs in the background and updates the list of search results in the **Search** view.

Related Tasks.

- Section 4.14.2, “Searching References to Elements” [179]

Related References.

- Section 5.4.5, “Rule Search Dialog” [220]

4.14.2. Searching References to Elements

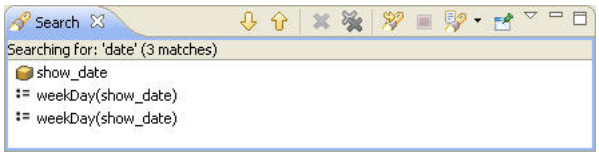
In order to search the references to a specific element, do the following:

1. In the **Rule Explorer** select the specific element you want to search the references for.
2. Right-click on the selected element.
3. Select **Search References** from the context menu and select the scope of your search. The **Search** view appears automatically and displays all references to the element.

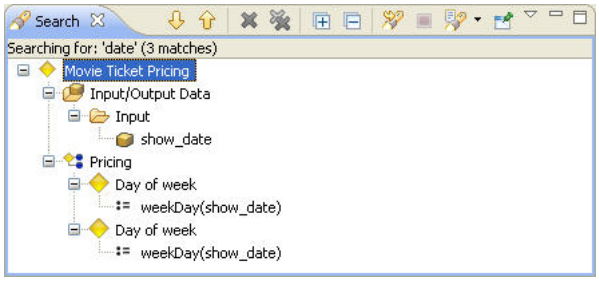
4.14.3. Working with the Search View

- Search offers two different views. Use the button to switch between the different views:

  Show as List- Shows all found elements in a list.

  Show as Tree - Shows all found elements in a hierarchical view. It always starts out from the rule model. Use this view if you have many matches in a workspace with many models or rules.

- If you double-click on a match in the **Search** view, the related rule editor or **Rule Explorer** opens automatically and the correct item is selected.
- Use the button to run the current search again.
- With the button you can open previous searches.
- If you want to keep one search result shown, even if you search for another element, use the button to pin the search view. If you execute a new search, a second **Search** view will be opened and the new result will be displayed in it.

4.15. Highlighting a referenced Element in the Rule Explorer

You can highlight an element, which is being referred to (e.g. in the **Flow Rule Editor** or in the **Properties View**), in the **Rule Explorer**. This applies to data types, data elements, actions and services.

To highlight a referenced element, press the **Ctrl** key and click on the relevant reference.

If the reference is contained in an editable field (e.g. in a flow rule element), you first need to double-click on that field. The **Inplace Editor** will open and thus the reference will be accessible.

4.16. Comparing Rules

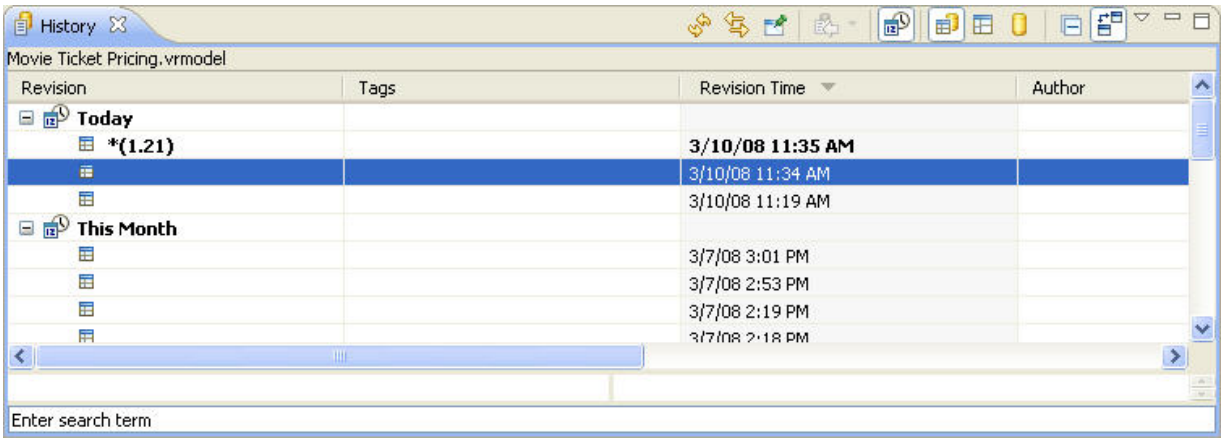
4.16.1. Comparing Rule Models and Rule Packages

There are two possibilities to compare rule models or rule packages:

Compare With History...

In order to compare one rule model or rule package with its history, do the following:

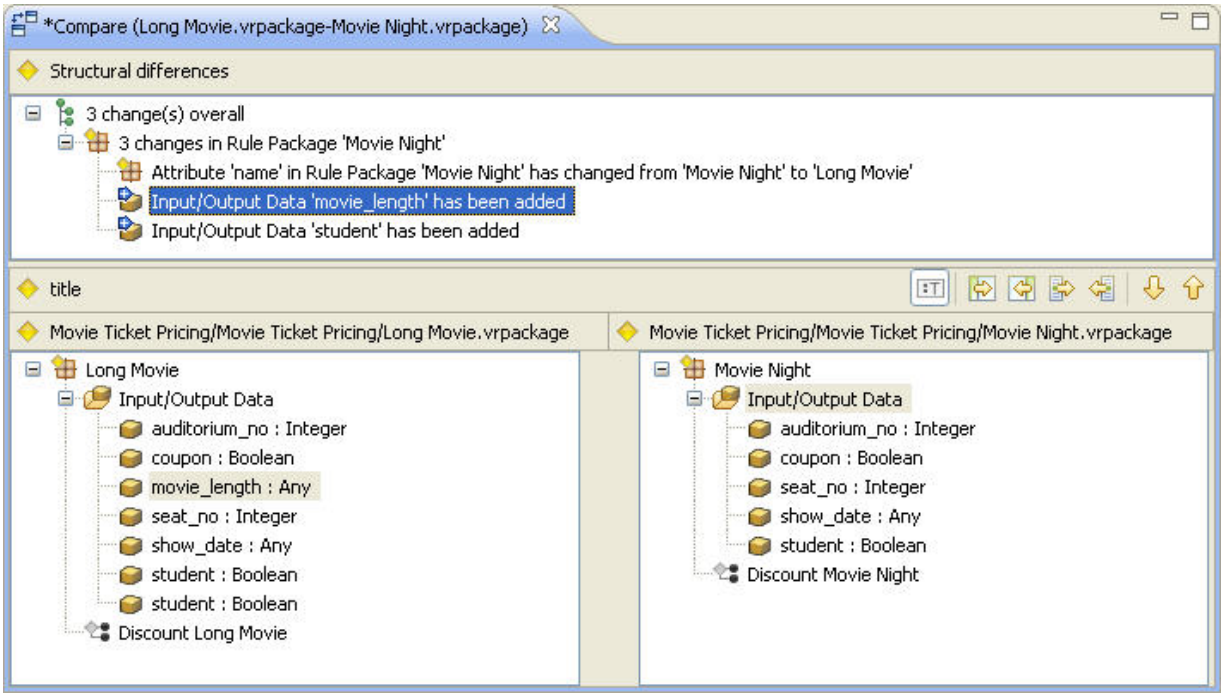
1. Select the rule model or rule package you want to compare with its history.
2. Right-click and select **Compare With > History...** from the context menu.
3. A **History** view opens that shows the changes along with the date and time of each change.



Compare With Each Other

To compare two rule models or rule packages with each other, do the following:

1. Select the two rule models or rule packages you want to compare with each other.
2. Right-click and select **Compare With > Each Other** from the context menu.
3. The **Compare** view opens and the changes between both rule models or rule packages are displayed.



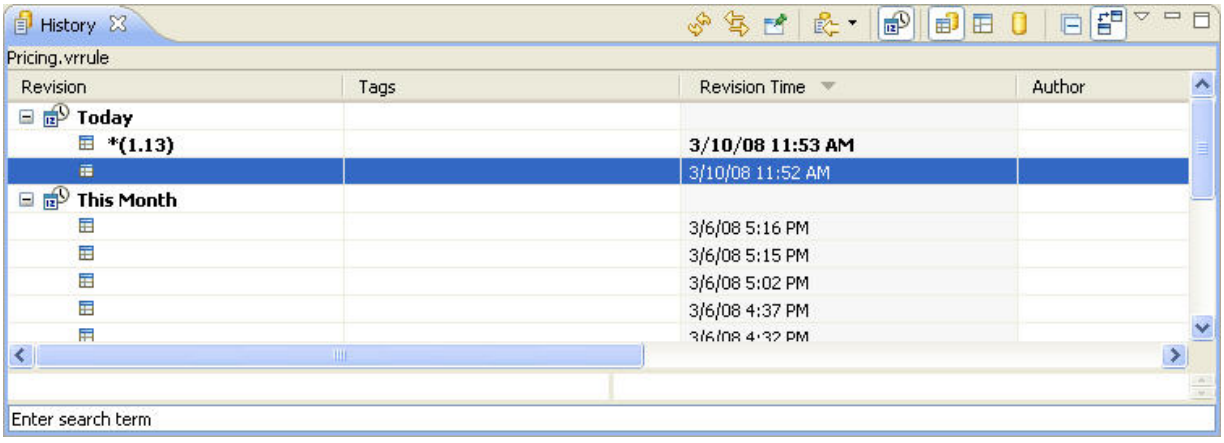
4.16.2. Comparing Rules

There are two possibilities to compare rule models or rule packages:

Compare With History...

In order to compare a rule with its history, do the following:

1. Select the rule you want to compare with its history.
2. Right-click and select **Compare With > History...** from the context menu.
3. A **History** view opens that shows the changes along with the date and time of change.
4. Double-click on an entry in the history.
5. The **Compare** view opens showing the differences between your current version and the selected version.



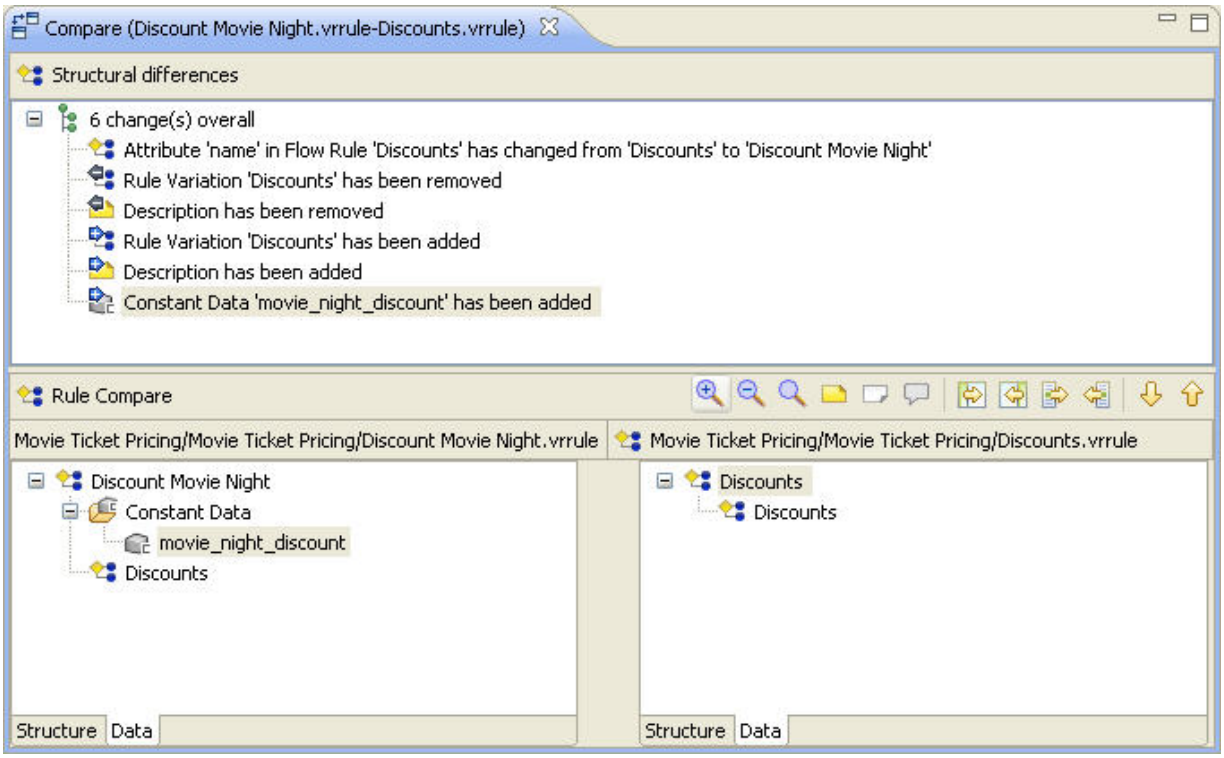
Compare With Each Other

To compare two rules with each other, do the following:

1. Select the two rules you want to compare with each other.

2. Right-click and select **Compare With > Each Other** from the context menu.

3. The **Compare** view opens and the changes between both rules are displayed.

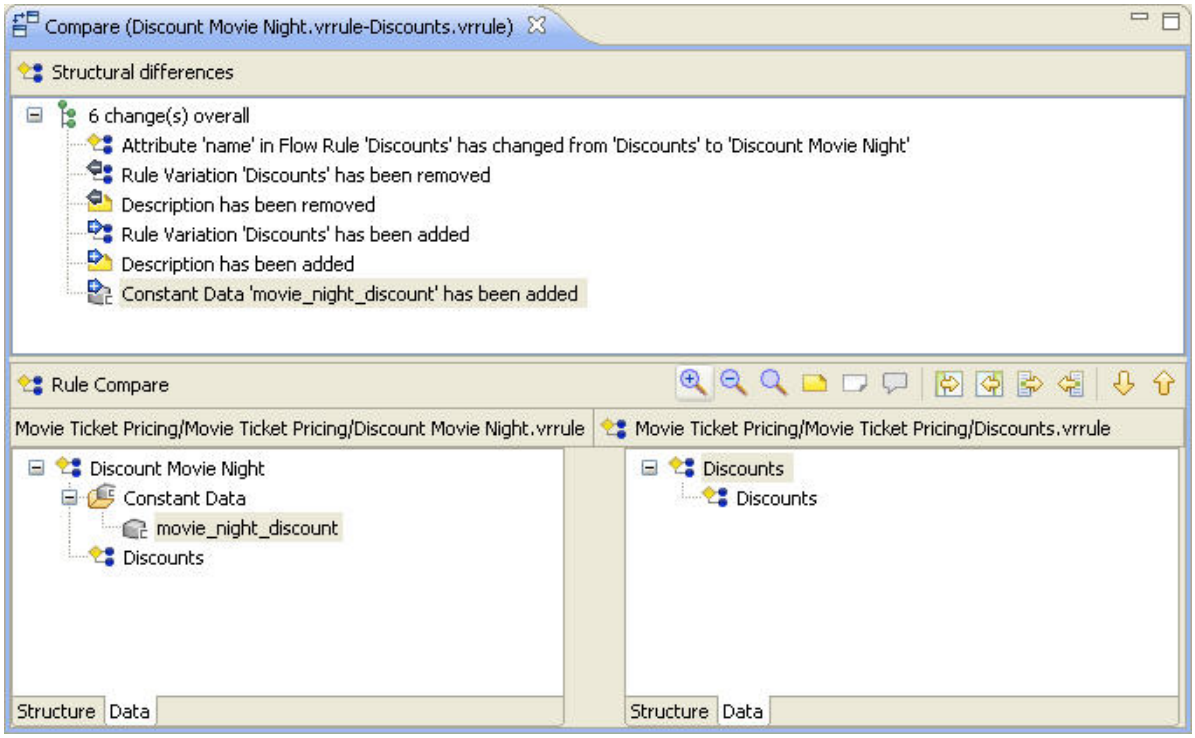


4.16.3. Working with the Compare View

- At the top of the **Compare** view the **Structural differences** are shown. If you double-click on a change, the rule element that has been changed is shown below.

  If you compare with history, the current rule version is shown on the left side and its earlier version on the right side.

  You can switch between the **Structure** and **Data** tabs at the bottom of the view. The **Structure** tab graphically shows the rule structure and the **Data** tab shows data elements, actions, types etc. defined by the rule.



- Use the and buttons to navigate through the changes. Depending on the type of the selected change the **Structure** or **Data** tab will be shown.
- It is possible to redo changes by copying changes from the history into the current rule element. That means copy changes from right to left.

  Use to copy all changes from right to left.

  Use to copy the currently selected change from right to left.

4.17. Import and Export

4.17.1. Importing a Rule Model

You have the option of importing an existing rule project into your Visual Rules workspace. This can be useful for transferring a rule project from another Visual Rules installation.

To import an existing rule project located outside your workspace, do the following:

1. Select **File** > **Import** from the menu.
2. Select the item **Existing Project into Workspace** from the list of import sources. Then click on the **Next >** button.
3. Choose if you want to import a rule project that is an archive file or not. **Select root directory** if it is not an archive file and **Select archive file** if it is one.
4. Now click on **Browse...** and select the rule project folder.
5. Check the **Copy projects into workspace** checkbox if you want to copy the files into your workspace (recommended). Otherwise the files will remain at their location and your project will be linked to these.
6. Complete the process by clicking on the **Finish** button.

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4.17.2. Exporting a Rule Model

You can export a rule project and save it in the file system outside the workspace. Go through the following steps to export a rule project:

1. Select **File** > **Export** from the menu. An export wizard opens.
2. Select **File system** as the destination to save all rule project files directly to the file system. Alternatively, you can choose **Archive file** as the export destination to save all rule project files in a ZIP (or tar.gz) archive outside the workspace.
3. Now select the rule project to export on the left side of the dialog.
4. Define a destination directory or an archive file in the desired format to save the rule project into.
5. Complete the process by clicking on the **Finish** button.

4.18. Generating Documentation

4.18.1. Generating Documentation

Visual Rules can generate documentation for rule models, rule packages, state flows or single rules.

1. Select the rule model, rule package, state flow or rule you want to create the documentation for in the **Rule Explorer**.
2. Select **File** > **Export...** from the menu to start the Export wizard.
3. Select the entry **Documentation** (in the **Visual Rules** folder) from the list.
4. Press **Next >**.
5. Select the **Target Directory** where the documentation should be saved. Click on the **Browse** button to open a file browser and select the target for the documentation.
6. Select the **Format** HTML, PDF or WORD in which you want the documentation to be generated.

   The output as a Microsoft Word-document is fully supported with BIRT-Versions 2.6.2 and higher. Microsoft Word provides the possibility to have a table of contents created for the documentation. Due to the limited page width of Microsoft Word-documents it may be necessary to minimize the width of the images. This can for instance be achieved by decreasing the maximum element width in the preferences of the Flow Rule Editor.

7. Select the **Template** to use. You can choose between two templates for specifying the detail level of the generated documentation. The first one generates documentation with **All packages, rules and state flows with detail pages** the other one generates documentation with **All packages, rules and state flows with detail pages (without rule images)**.

   If you have selected the option **All packages and rules with detail pages**, you can select which information should be displayed in the images of rules. Here you can display rules with **Descriptions**, **Contents**, **Call/Assignment Details**, **Notes**, **Statistics** and **Exception Handling**.

   For state flows statistics are not provided.

8. Press **Finish** to generate the documentation. An **index.html** file will be generated. Depending on the size of the rule model this may take several minutes to complete.

Related Tasks:

- Section 4.18.2, “Viewing the Documentation” [185]

4.18.2. Viewing the Documentation

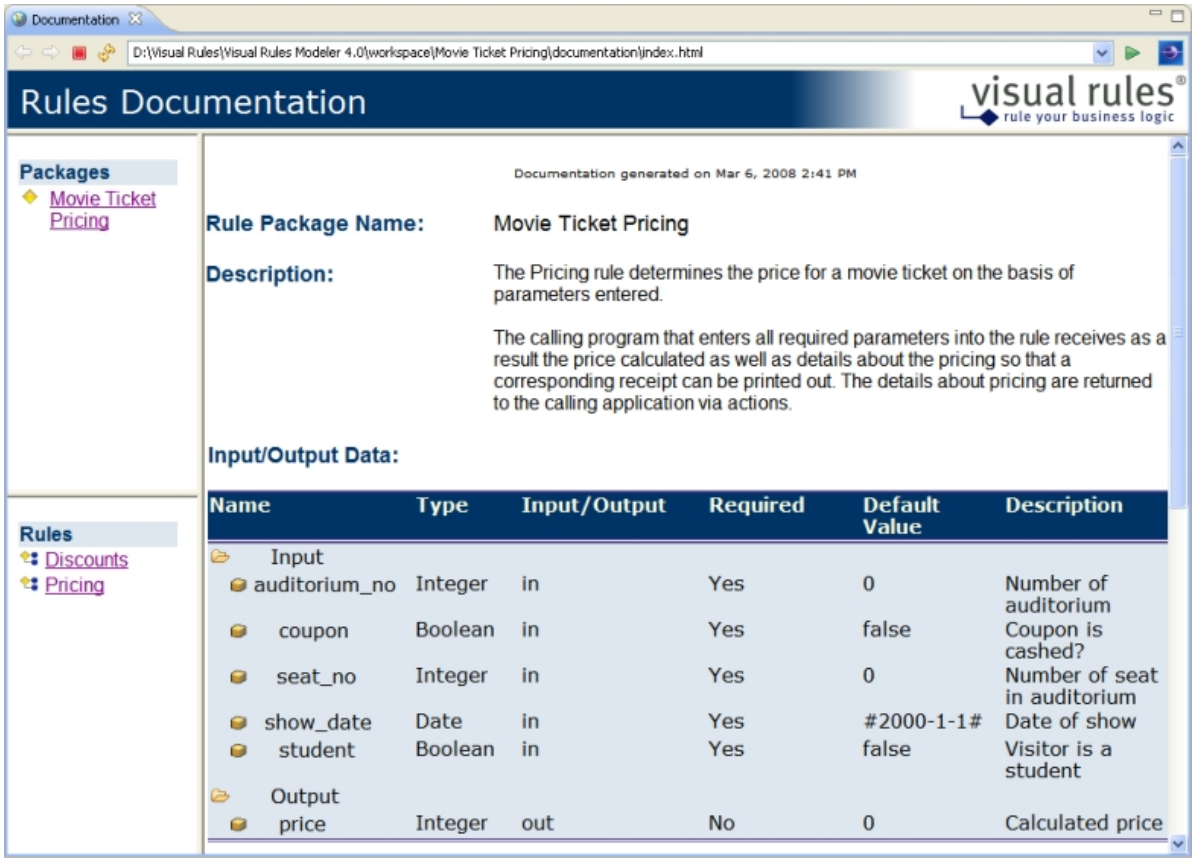
In order to view the generated documentation, open the folder in which the documentation was saved. Open the generated documentation (index.html file) with a web browser.

The documentation is divided in three parts.

- On the left side is the documentation displayed for the element that is selected.
- On top of the right side rule models and rule packages are shown. If you click on the name of a specific one the documentation is displayed for it.

  In the example this is the rule model **Movie Ticket Pricing**.

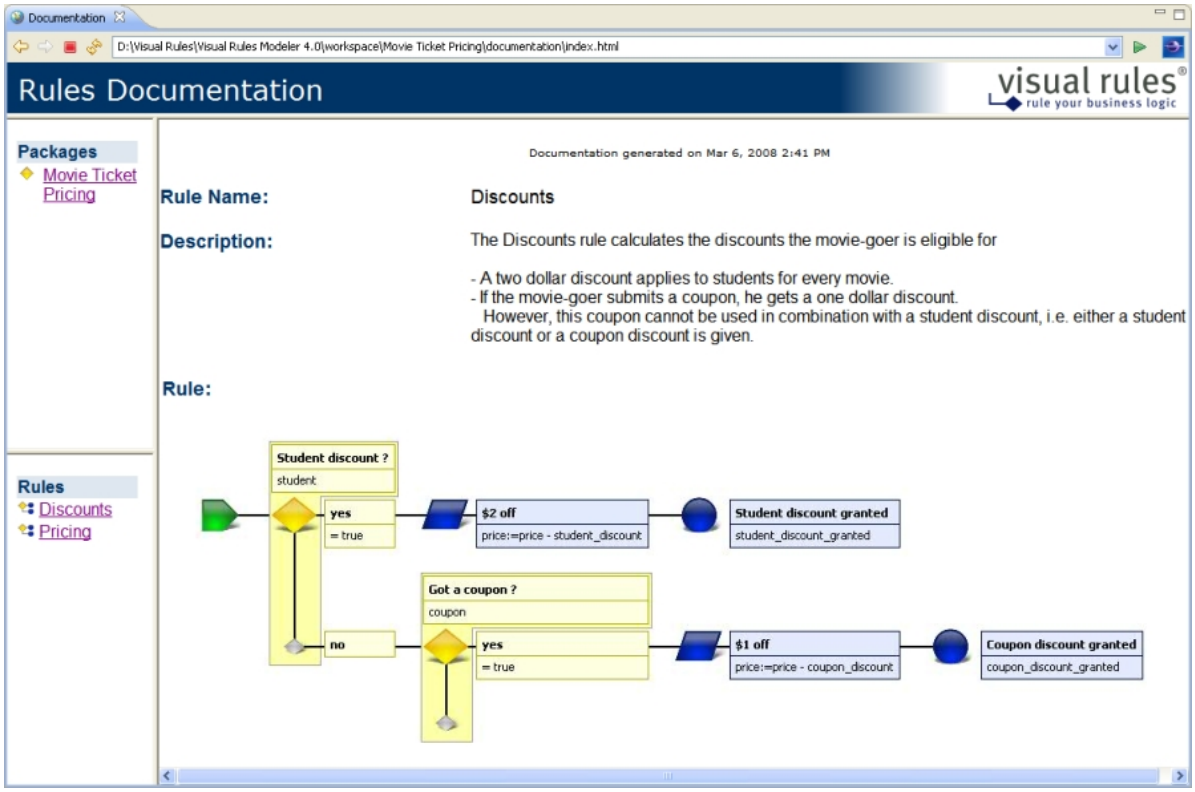
  The documentation shows the **Rule Package Name** (in this case the model name), the **Description** and all data elements like **Input/Output Data** that are defined for this model.


Documentation
D:\Visual Rules\Visual Rules Modeler 4.0\workspace\Movie Ticket Pricing\documentation\index.html
Rules Documentation
visual rules
rule your business logic
Packages
Movie Ticket Pricing
Rules
Discounts
Pricing
Documentation generated on Mar 6, 2008 2:41 PM
Rule Package Name: Movie Ticket Pricing
Description: The Pricing rule determines the price for a movie ticket on the basis of parameters entered.
The calling program that enters all required parameters into the rule receives as a result the price calculated as well as details about the pricing so that a corresponding receipt can be printed out. The details about pricing are returned to the calling application via actions.
Input/Output Data:
Name Type Input/Output Required Default Value Description
Input
auditorium_no Integer in Yes 0 Number of auditorium
coupon Boolean in Yes false Coupon is cashed?
seat_no Integer in Yes 0 Number of seat in auditorium
show_date Date in Yes #2000-1-1# Date of show
student Boolean in Yes false Visitor is a student
Output
price Integer out No 0 Calculated price

- On the right side under the list with the packages and models are the rules shown. The rules for the currently selected rule package or model are displayed. With the selection of one of the displayed rules the documentation on the left side switches to the documentation of this rule.

  In the example is the rule **Discounts** displayed.

  The documentation includes the **Rule Name**, its **Description** and the **Rule** in the graphical view.



Related Tasks:

- Section 4.18.1, “Generating Documentation” [184]

4.19. Printing

4.19.1. Printing a Rule

To print a rule, do the following:

1. Open the rule editor with the rule you want to print.

   If necessary, set preferences for things that may influence the appearance of the printout, such as the maximum element width or height.

2. Now select **File** > **Print...** from the menu.

3. Print options can be set in the dialog that appears:

   Enter a scaling factor for the rule at the top left. This influences the number of pages required to print out the rule in full. You can also insert the number of pages available to print the full rule on. The scaling factor will be adjusted automatically to the maximum size possible for printing on the available number of pages.

   A preview of the rule is displayed on the right, showing how the rule will look like on the printed pages.

   Besides the scaling factor, another important thing that influences how the rule is printed across several pages is the printer and page format selected. Both can be set via the **Printer Options** button.

   The **Fit to Pages** button scales the rule to the current number of pages shown. The number of pages also depends on the scaling factor.

   Click on the **Fit to one Page** button to print the rule on one page. The **Reset** button allows you to reset the scale to the original value of 100%.

   If needed, you can also set a margin in the margin settings or select that header or footer should be printed for the rule.

4. Select the desired printer and set the print options.

5. Click on **Print** to start printing.

The exported image displays the rule exactly as displayed in the rule editor. This makes it possible, for example, to hide specific branches in the exported image.

Related References:

- Section 5.7.2, “Flow Rule Editor Preferences” [263]

4.20. Working with the User Interface

4.20.1. Switching Perspectives

A perspective is a pre-defined user interface layout. Visual Rules offers several different perspectives for different tasks, e.g. general rule modeling should be done using the **Rule Modeling** perspective.

- Currently open perspectives are displayed at the top right. Click on the corresponding icon to switch to either the **Rule Modeling** or the **Rule Integration** perspective.

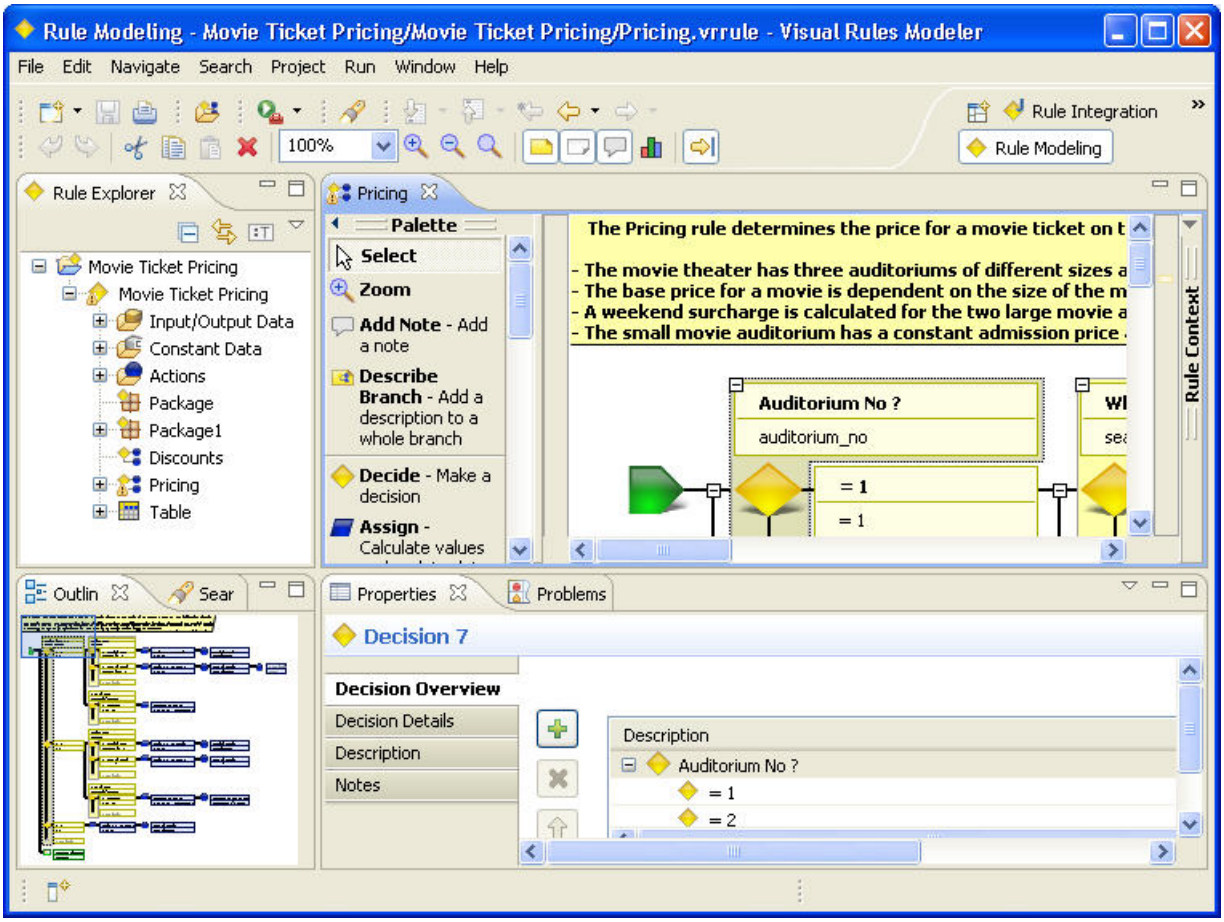
  If the desired perspective is not available, add it by clicking on the ( ) icon. Select **Other...** from the menu and then select the perspective from the list. Alternatively, you can add the perspectives via the following menu: **Window** > **Open Perspective** > **Other...**

Related References.

- Section 5.1.1, “Rule Modeling Perspective” [197]
- Section 5.1.2, “Rule Integration Perspective” [198]

4.20.2. Customizing Perspectives and Views

A perspective consists of different views that are arranged in a specific way to make best use of the screen estate. The views are surrounding an area where editors appear, like e.g. the rule editor or the test editor.



The individual views can be changed in size and position. Views can also be placed over each other, as for example, the lower right section in the picture above, where the **Properties** and **Problems** views are overlapping. Clicking on the name tab of a view at its top border brings it to the front.

The default state of a perspective can be restored by selecting **Window** > **Reset Perspective** from the menu.

General information about perspectives can be found in the "Getting started" section of the Workbench User Guide.

4.20.3. Opening Views

1. Use the **Window > Show View** menu entry to add views to the current perspective.
2. Select a view from the sub menu or select the **Other...** menu entry to open a list of all available views. Select the view from the list and click **OK**.
3. The view is added to the perspective. You can now drag it to the desired position.

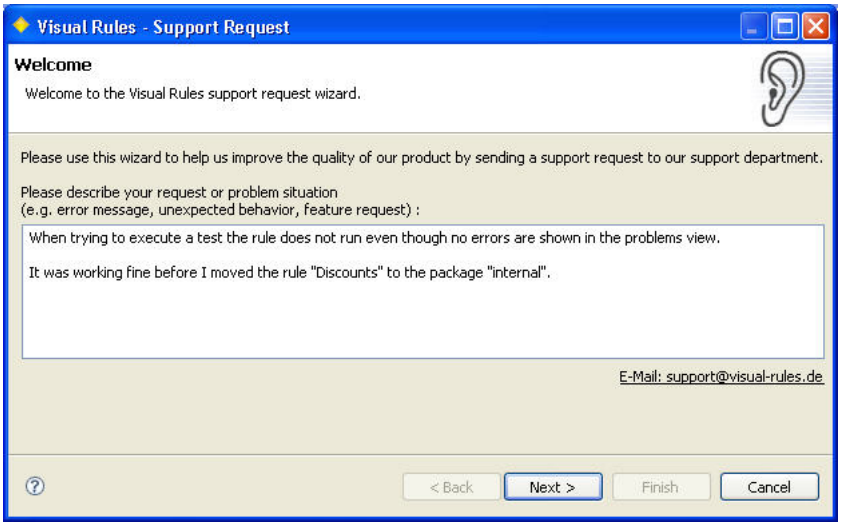
Visual Rules specific views can all be found in the **Visual Rules** category.

4.21. Sending a Support Request

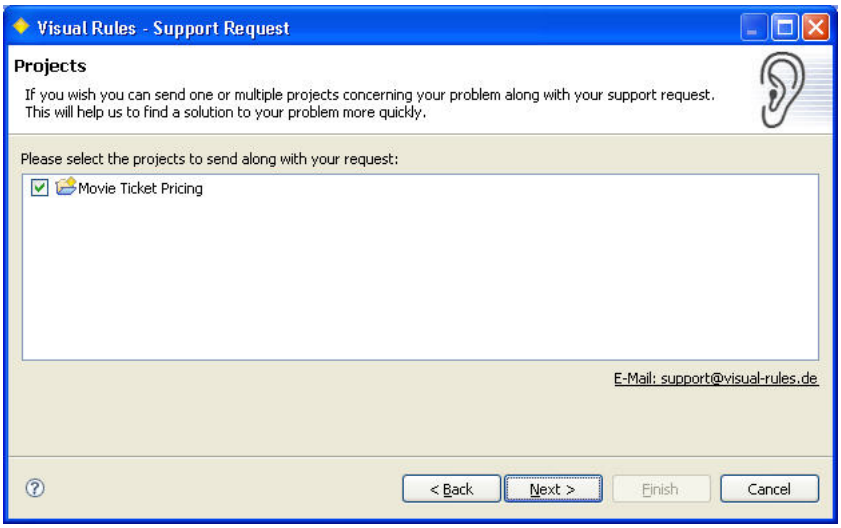
If you encounter a problem while working with Visual Rules the product can aid you in submitting a support request.

1. Use the **Help > Visual Rules Support Request...** menu entry to open the support request dialog.

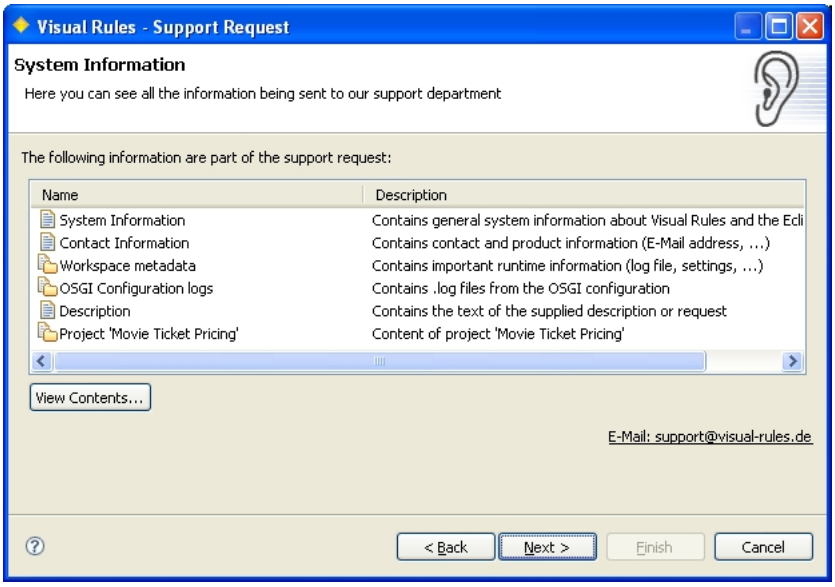
2. Enter a description of your problem or feature request. Try to include as many details as possible. When you are done press **Next >**.


Visual Rules - Support Request
Welcome
Welcome to the Visual Rules support request wizard.
Please use this wizard to help us improve the quality of our product by sending a support request to our support department.
Please describe your request or problem situation
(e.g. error message, unexpected behavior, feature request) :
When trying to execute a test the rule does not run even though no errors are shown in the problems view.
It was working fine before I moved the rule "Discounts" to the package "internal".
E-Mail: support@visual-rules.de
< Back
Next >
Finish
Cancel

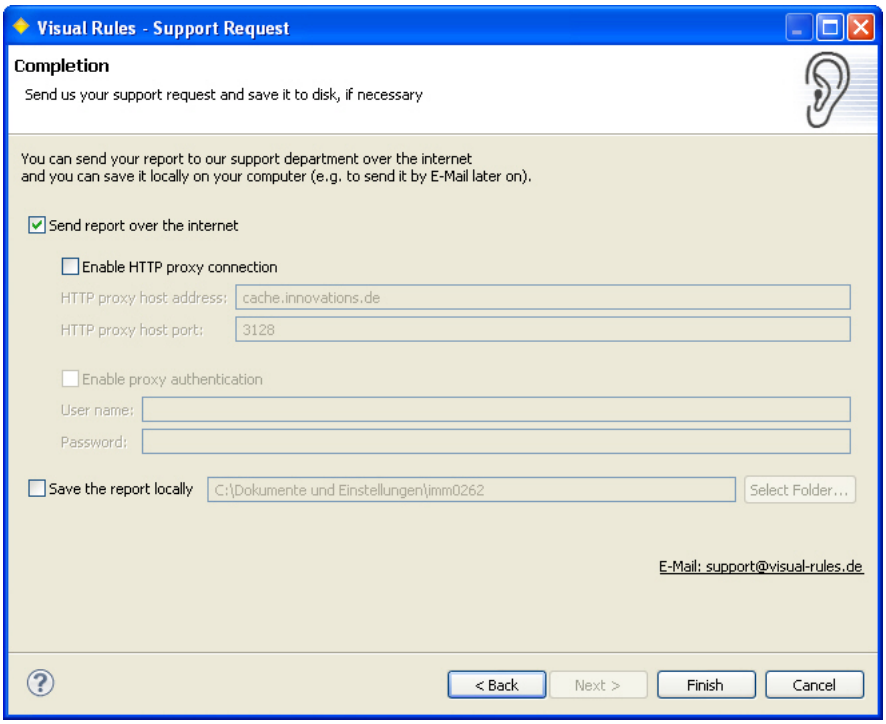
3. Select the projects you'd like to include in the support request. When submitting bug reports you should include the projects that are affected whenever this is possible. After you have selected the projects press **Next >**.


Visual Rules - Support Request
Projects
If you wish you can send one or multiple projects concerning your problem along with your support request.
This will help us to find a solution to your problem more quickly.
Please select the projects to send along with your request:
Movie Ticket Pricing
E-Mail: support@visual-rules.de
< Back
Next >
Finish
Cancel

4. You will receive an overview over the information that will be sent. If you want detailed information about one of the items in the list click on it and press **View Contents...**. Press **Next >**.


Visual Rules - Support Request
System Information
Here you can see all the information being sent to our support department
The following information are part of the support request:
Name
Description
System Information
Contains general system information about Visual Rules and the Ecli
Contact Information
Contains contact and product information (E-Mail address, ...)
Workspace metadata
Contains important runtime information (log file, settings, ...)
OSGI Configuration logs
Contains .log files from the OSGI configuration
Description
Contains the text of the supplied description or request
Project 'Movie Ticket Pricing'
Content of project 'Movie Ticket Pricing'
View Contents...
E-Mail: support@visual-rules.de
< Back
Next >
Finish
Cancel

5. Select what to do with the generated report. You can either directly send it over the internet or save it locally. After you have made your choice press **Finish**.

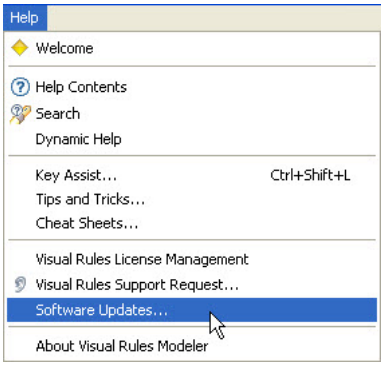

Visual Rules - Support Request
Completion
Send us your support request and save it to disk, if necessary
You can send your report to our support department over the internet
and you can save it locally on your computer (e.g. to send it by E-Mail later on).
Send report over the internet
Enable HTTP proxy connection
HTTP proxy host address:
cache.innovations.de
HTTP proxy host port:
3128
Enable proxy authentication
User name:
Password:
Save the report locally
C:\Dokumente und Einstellungen\jmm0262
Select Folder...
E-Mail: support@visual-rules.de
< Back
Next >
Finish
Cancel

4.22. Updating a new Version of Visual Rules

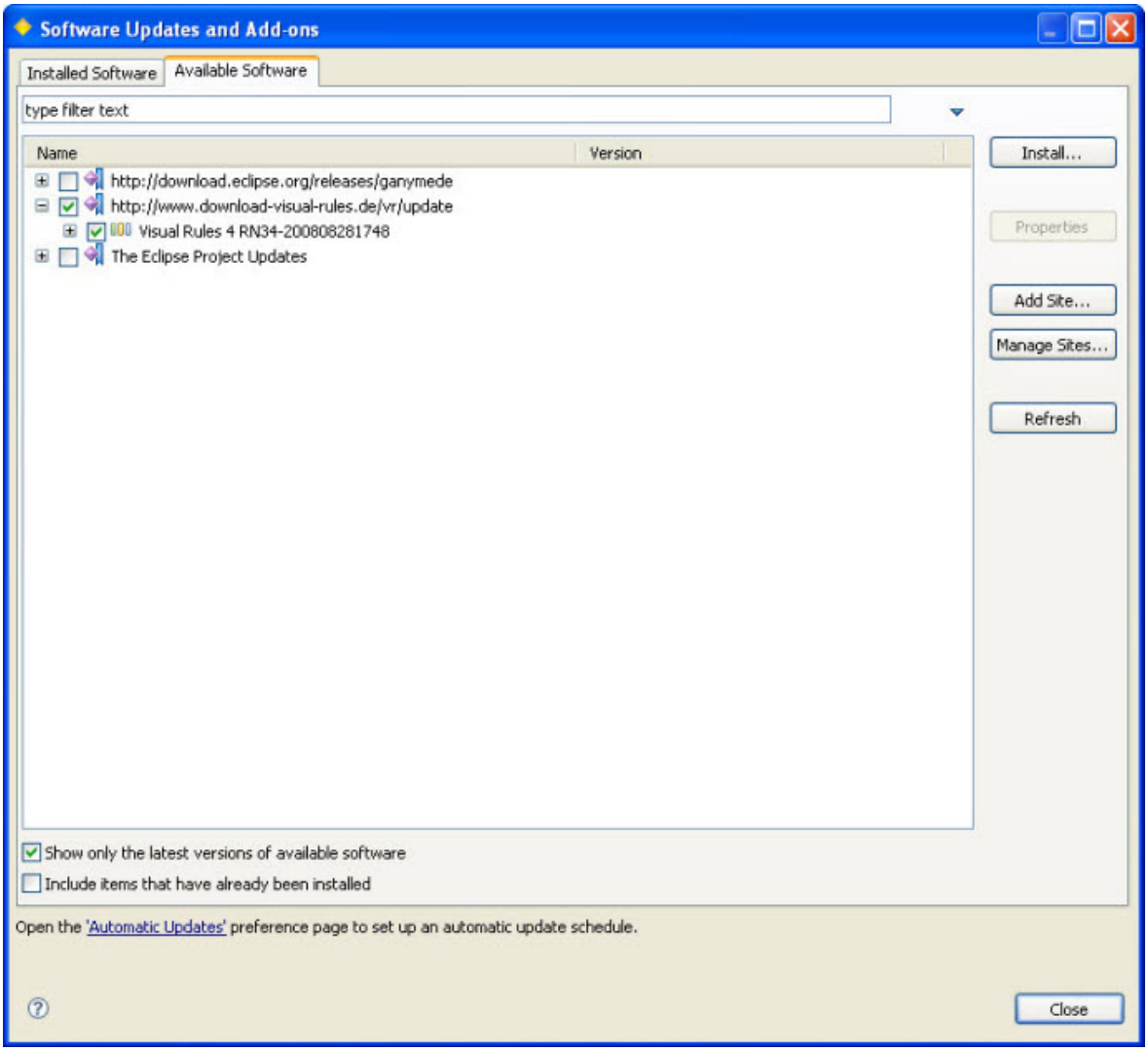
If you wish to get a new version of Visual Rules, please apply **Software Updates** in the **Help** menu. There are two ways to update Visual Rules, one way is to use **Available Software** and **Install** or the second way is to use **Installed Software** and **Update**. For the second way, there is the possibility to automatically get a notification about new Software Updates by configuring this feature as shown below. The shown mechanism refers to Eclipse 3.4 and higher, for Eclipse 3.2 and 3.3 the mechanism is rather similar.

First way to update Visual Rules with Available Software:

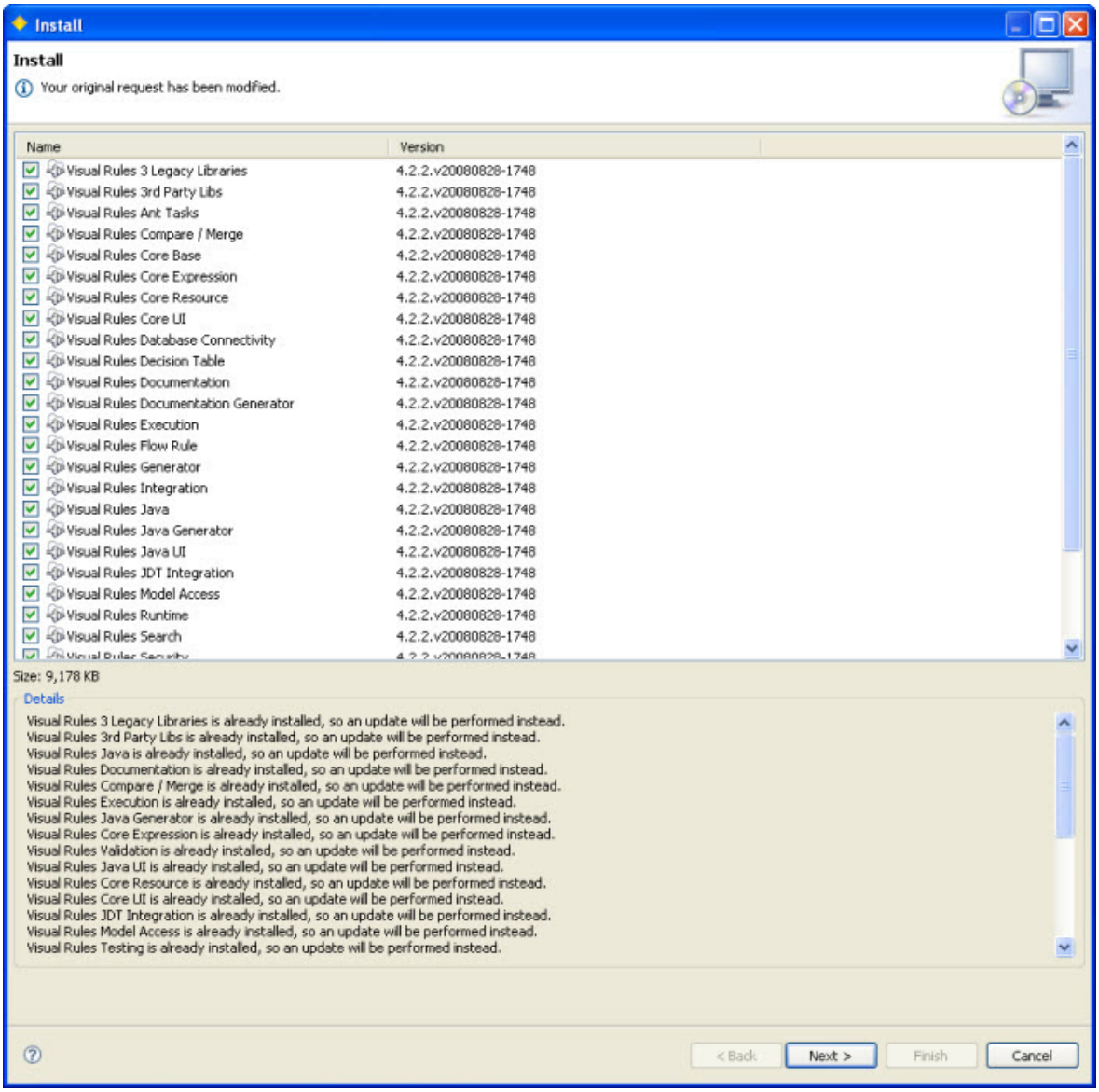
1. Use the **Help > Software Updates...** menu entry to update the current version of Visual Rules.



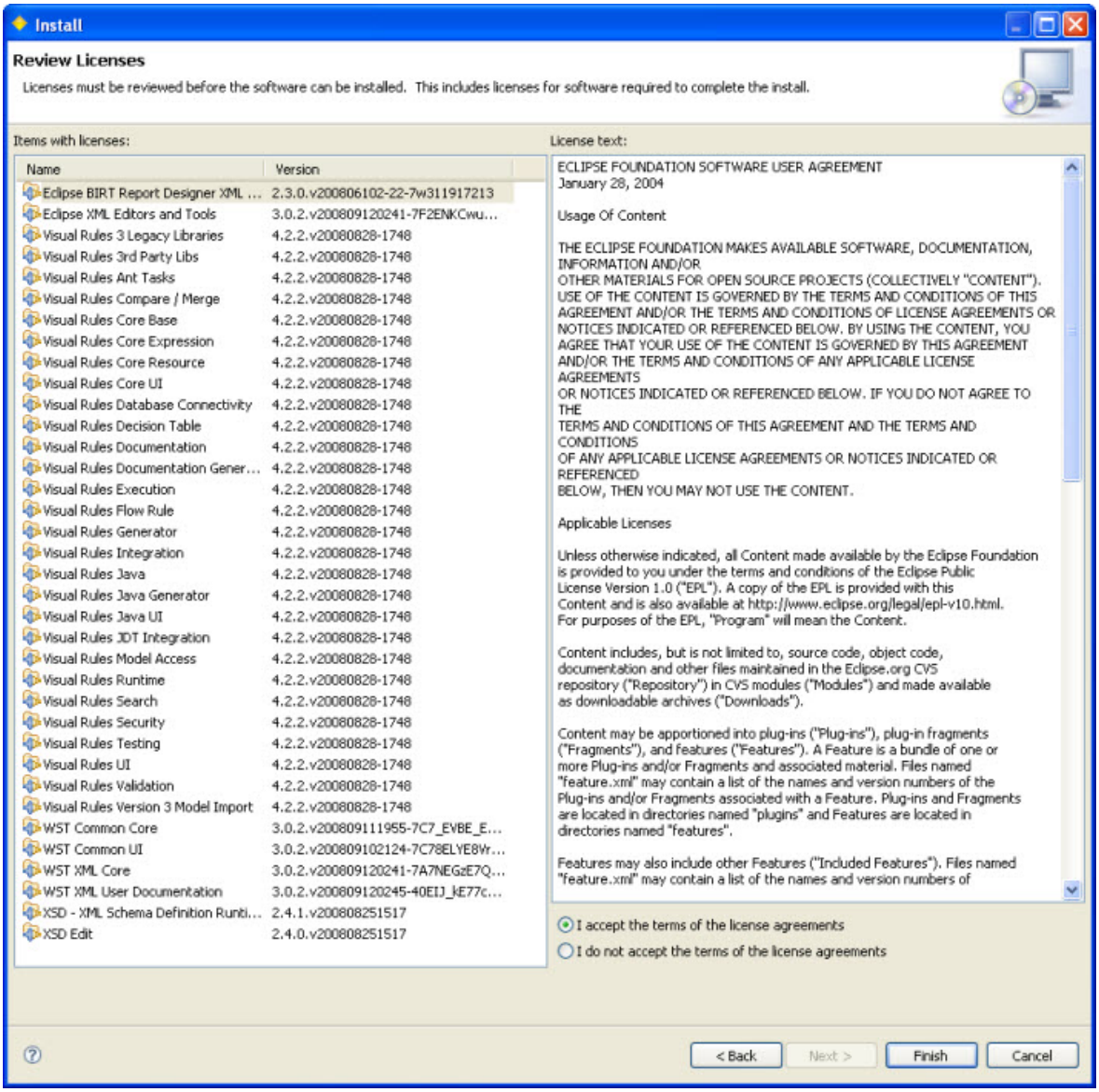
2. Select from **Available Software** the following update location http://www.download-visual-rules.de/vr/update with the current update version of Visual Rules and click on **Install**.



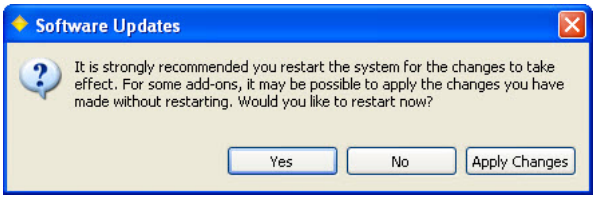
3. You will see all packages, which will be installed for updating a new version and click on **Next**.


Install
Install
Your original request has been modified.
Name
Version
Visual Rules 3 Legacy Libraries 4.2.2.v20080828-1748
Visual Rules 3rd Party Libs 4.2.2.v20080828-1748
Visual Rules Ant Tasks 4.2.2.v20080828-1748
Visual Rules Compare / Merge 4.2.2.v20080828-1748
Visual Rules Core Base 4.2.2.v20080828-1748
Visual Rules Core Expression 4.2.2.v20080828-1748
Visual Rules Core Resource 4.2.2.v20080828-1748
Visual Rules Core UI 4.2.2.v20080828-1748
Visual Rules Database Connectivity 4.2.2.v20080828-1748
Visual Rules Decision Table 4.2.2.v20080828-1748
Visual Rules Documentation 4.2.2.v20080828-1748
Visual Rules Documentation Generator 4.2.2.v20080828-1748
Visual Rules Execution 4.2.2.v20080828-1748
Visual Rules Flow Rule 4.2.2.v20080828-1748
Visual Rules Generator 4.2.2.v20080828-1748
Visual Rules Integration 4.2.2.v20080828-1748
Visual Rules Java 4.2.2.v20080828-1748
Visual Rules Java Generator 4.2.2.v20080828-1748
Visual Rules Java UI 4.2.2.v20080828-1748
Visual Rules JDT Integration 4.2.2.v20080828-1748
Visual Rules Model Access 4.2.2.v20080828-1748
Visual Rules Runtime 4.2.2.v20080828-1748
Visual Rules Search 4.2.2.v20080828-1748
Size: 9,178 KB
Details
Visual Rules 3 Legacy Libraries is already installed, so an update will be performed instead.
Visual Rules 3rd Party Libs is already installed, so an update will be performed instead.
Visual Rules Java is already installed, so an update will be performed instead.
Visual Rules Documentation is already installed, so an update will be performed instead.
Visual Rules Compare / Merge is already installed, so an update will be performed instead.
Visual Rules Execution is already installed, so an update will be performed instead.
Visual Rules Java Generator is already installed, so an update will be performed instead.
Visual Rules Core Expression is already installed, so an update will be performed instead.
Visual Rules Validation is already installed, so an update will be performed instead.
Visual Rules Java UI is already installed, so an update will be performed instead.
Visual Rules Core Resource is already installed, so an update will be performed instead.
Visual Rules Core UI is already installed, so an update will be performed instead.
Visual Rules JDT Integration is already installed, so an update will be performed instead.
Visual Rules Model Access is already installed, so an update will be performed instead.
Visual Rules Testing is already installed, so an update will be performed instead.
< Back
Next >
Finish
Cancel

4. For the new version of Visual Rules the Licenses must be reviewed. For this reason, you have to accept the terms of the license agreements. Read the license agreements carefully and select **I accept the terms in the license agreements**, if you consent to the agreements. Click on **Finish.**


Install
Review Licenses
Licenses must be reviewed before the software can be installed. This includes licenses for software required to complete the install.
Items with licenses:
License text:
Name
Version
Eclipse BIRT Report Designer XML ... 2.3.0.v200806102-22-7w311917213
Eclipse XML Editors and Tools 3.0.2.v200809120241-7F2ENKCwu...
Visual Rules 3 Legacy Libraries 4.2.2.v20080828-1748
Visual Rules 3rd Party Libs 4.2.2.v20080828-1748
Visual Rules Ant Tasks 4.2.2.v20080828-1748
Visual Rules Compare / Merge 4.2.2.v20080828-1748
Visual Rules Core Base 4.2.2.v20080828-1748
Visual Rules Core Expression 4.2.2.v20080828-1748
Visual Rules Core Resource 4.2.2.v20080828-1748
Visual Rules Core UI 4.2.2.v20080828-1748
Visual Rules Database Connectivity 4.2.2.v20080828-1748
Visual Rules Decision Table 4.2.2.v20080828-1748
Visual Rules Documentation 4.2.2.v20080828-1748
Visual Rules Documentation Gener... 4.2.2.v20080828-1748
Visual Rules Execution 4.2.2.v20080828-1748
Visual Rules Flow Rule 4.2.2.v20080828-1748
Visual Rules Generator 4.2.2.v20080828-1748
Visual Rules Integration 4.2.2.v20080828-1748
Visual Rules Java 4.2.2.v20080828-1748
Visual Rules Java Generator 4.2.2.v20080828-1748
Visual Rules Java UI 4.2.2.v20080828-1748
Visual Rules JDT Integration 4.2.2.v20080828-1748
Visual Rules Model Access 4.2.2.v20080828-1748
Visual Rules Runtime 4.2.2.v20080828-1748
Visual Rules Search 4.2.2.v20080828-1748
Visual Rules Security 4.2.2.v20080828-1748
Visual Rules Testing 4.2.2.v20080828-1748
Visual Rules UI 4.2.2.v20080828-1748
Visual Rules Validation 4.2.2.v20080828-1748
Visual Rules Version 3 Model Import 4.2.2.v20080828-1748
WST Common Core 3.0.2.v200809111955-7C7_EVBE_E...
WST Common UI 3.0.2.v200809102124-7C78ELYE8Vr...
WST XML Core 3.0.2.v200809120241-7A7NEGzE7Q...
WST XML User Documentation 3.0.2.v200809120245-40EIJ_kE77c...
XSD - XML Schema Definition Runti... 2.4.1.v200808251517
XSD Edit 2.4.0.v200808251517
ECLIPSE FOUNDATION SOFTWARE USER AGREEMENT
January 28, 2004
Usage Of Content
THE ECLIPSE FOUNDATION MAKES AVAILABLE SOFTWARE, DOCUMENTATION, INFORMATION AND/OR
OTHER MATERIALS FOR OPEN SOURCE PROJECTS (COLLECTIVELY "CONTENT").
USE OF THE CONTENT IS GOVERNED BY THE TERMS AND CONDITIONS OF THIS AGREEMENT AND/OR THE TERMS AND CONDITIONS OF LICENSE AGREEMENTS OR NOTICES INDICATED OR REFERENCED BELOW. BY USING THE CONTENT, YOU AGREE THAT YOUR USE OF THE CONTENT IS GOVERNED BY THIS AGREEMENT AND/OR THE TERMS AND CONDITIONS OF ANY APPLICABLE LICENSE AGREEMENTS
OR NOTICES INDICATED OR REFERENCED BELOW. IF YOU DO NOT AGREE TO THE
TERMS AND CONDITIONS OF THIS AGREEMENT AND THE TERMS AND CONDITIONS
OF ANY APPLICABLE LICENSE AGREEMENTS OR NOTICES INDICATED OR REFERENCED
BELOW, THEN YOU MAY NOT USE THE CONTENT.
Applicable Licenses
Unless otherwise indicated, all Content made available by the Eclipse Foundation is provided to you under the terms and conditions of the Eclipse Public License Version 1.0 ("EPL"). A copy of the EPL is provided with this Content and is also available at http://www.eclipse.org/legal/epl-v10.html. For purposes of the EPL, "Program" will mean the Content.
Content includes, but is not limited to, source code, object code, documentation and other files maintained in the Eclipse.org CVS repository ("Repository") in CVS modules ("Modules") and made available as downloadable archives ("Downloads").
Content may be apportioned into plug-ins ("Plug-ins"), plug-in fragments ("Fragments"), and features ("Features"). A Feature is a bundle of one or more Plug-ins and/or Fragments and associated material. Files named "feature.xml" may contain a list of the names and version numbers of the Plug-ins and/or Fragments associated with a Feature. Plug-ins and Fragments are located in directories named "plugins" and Features are located in directories named "features".
Features may also include other Features ("Included Features"). Files named "feature.xml" may contain a list of the names and version numbers of
I accept the terms of the license agreements
I do not accept the terms of the license agreements
< Back
Next >
Finish
Cancel

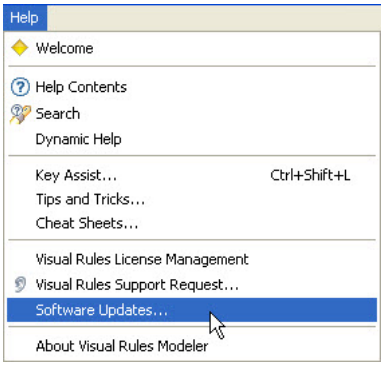
5. After downloading, the installation of the software starts. At the end of the installation the dialog **Software Updates** appears to request the restart of eclipse. Confirm the dialog by clicking on **Yes** and Eclipse restarts.


Software Updates
It is strongly recommended you restart the system for the changes to take effect. For some add-ons, it may be possible to apply the changes you have made without restarting. Would you like to restart now?
Yes
No
Apply Changes

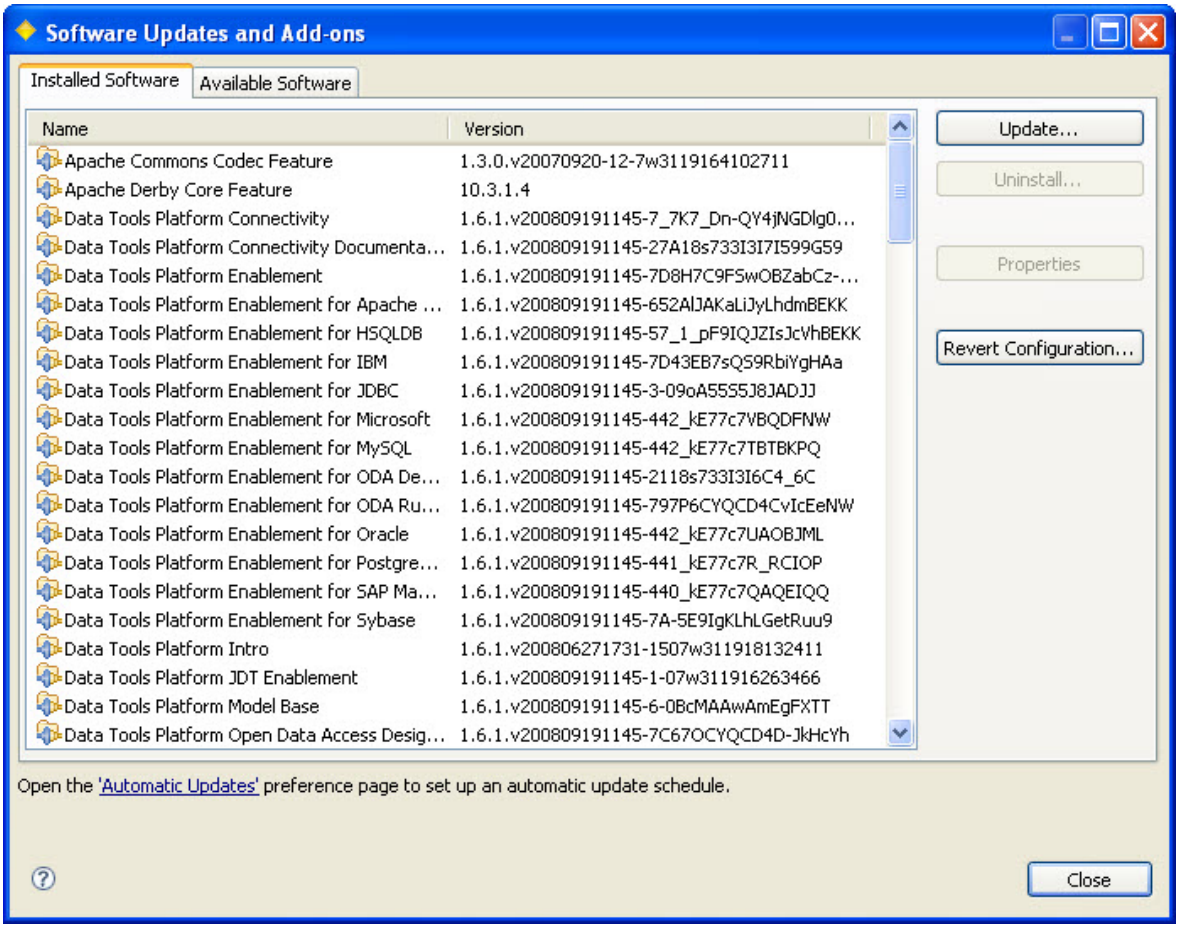
If you need a new license, please save the license file from our e-mail to your hard disk and import the new license file with Visual Rules License Manager. A short dialog will prompt you to restart Visual Rules for the changes to take effect. After that your installation is complete and you are able to work with Visual Rules.

Second way to update Visual Rules with Installed Software:

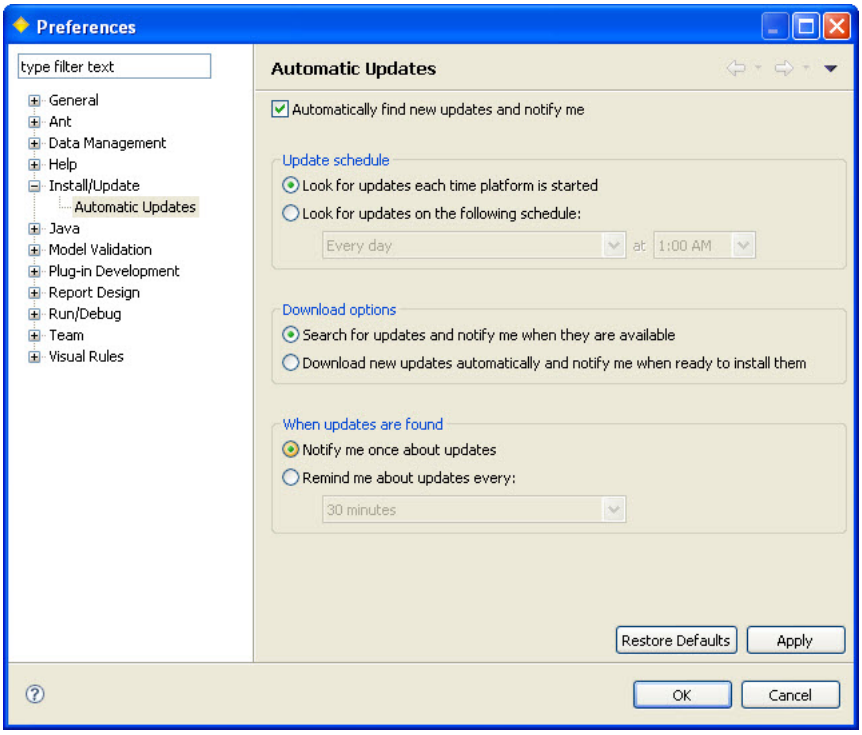
1. Use the **Help > Software Updates...** menu entry to update the current version of Visual Rules.



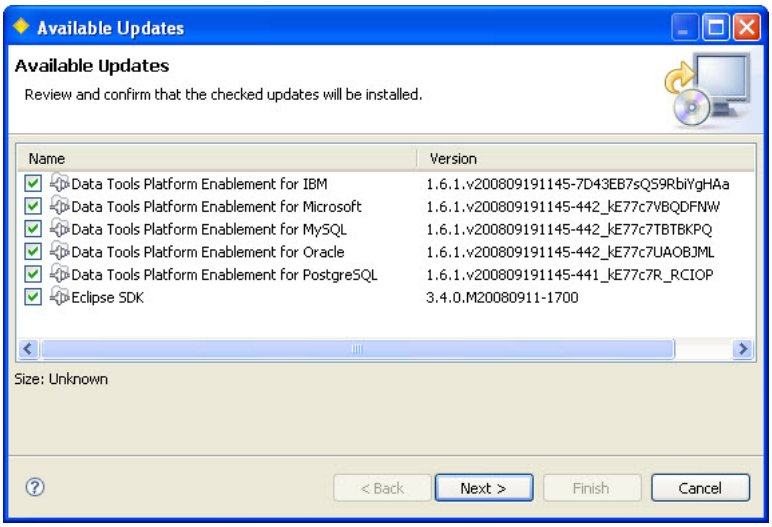
2. Select from **Installed Software** the preference page by clicking on **"Automatic Update"** at the bottom for configuring an automatic notification for updates. Otherwise continue with clicking on **Update**.


Software Updates and Add-ons
Installed Software
Available Software
Name
Version
Apache Commons Codec Feature 1.3.0.v20070920-12-7w3119164102711
Apache Derby Core Feature 10.3.1.4
Data Tools Platform Connectivity 1.6.1.v200809191145-7_7K7_Dn-QY4jNGDlg0...
Data Tools Platform Connectivity Documenta... 1.6.1.v200809191145-27A18s733I3I7I599G59
Data Tools Platform Enablement 1.6.1.v200809191145-7D8H7C9FSwOBZabCz-...
Data Tools Platform Enablement for Apache ... 1.6.1.v200809191145-652AlJAKaLiJyLhdmBEKK
Data Tools Platform Enablement for HSQLDB 1.6.1.v200809191145-57_1_pF9IQJZIsJcVhBEKK
Data Tools Platform Enablement for IBM 1.6.1.v200809191145-7D43EB7sQS9RbiYgHAa
Data Tools Platform Enablement for JDBC 1.6.1.v200809191145-3-09oA55S5J8JADJJ
Data Tools Platform Enablement for Microsoft 1.6.1.v200809191145-442_kE77c7VBQDFNW
Data Tools Platform Enablement for MySQL 1.6.1.v200809191145-442_kE77c7TBTBKPQ
Data Tools Platform Enablement for ODA De... 1.6.1.v200809191145-2118s733I3I6C4_6C
Data Tools Platform Enablement for ODA Ru... 1.6.1.v200809191145-797P6CYQCD4CvIcEeNW
Data Tools Platform Enablement for Oracle 1.6.1.v200809191145-442_kE77c7UAOBJML
Data Tools Platform Enablement for Postgre... 1.6.1.v200809191145-441_kE77c7R_RCIOP
Data Tools Platform Enablement for SAP Ma... 1.6.1.v200809191145-440_kE77c7QAQEIQQ
Data Tools Platform Enablement for Sybase 1.6.1.v200809191145-7A-5E9IgKLhLGetRuu9
Data Tools Platform Intro 1.6.1.v200806271731-1507w311918132411
Data Tools Platform JDT Enablement 1.6.1.v200809191145-1-07w311916263466
Data Tools Platform Model Base 1.6.1.v200809191145-6-0BcMAAwAmEgFXTT
Data Tools Platform Open Data Access Desig... 1.6.1.v200809191145-7C67OCYQCD4D-JkHcYh
Update...
Uninstall...
Properties
Revert Configuration...
Open the 'Automatic Updates' preference page to set up an automatic update schedule.
Close

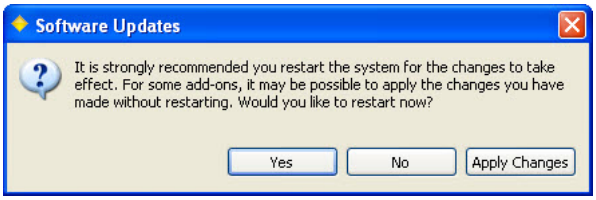
3. If you want to get an automatic notification for updates, please check **Automatically find new updates and notify me** and press **Apply** for confirmation. Otherwise continue with step 4.



4. Now you can review and confirm your updates by checking them and clicking on **Next**. For the new version of Visual Rules the Licenses must be reviewed. For this reason, you have to accept the terms of the license agreements. Read the license agreements carefully and select **I accept the terms in the license agreements**, if you consent to the agreements. Click on **Finish.**



5. After downloading, the update of the software starts. At the end of the Update the dialog **Software Updates** appears to request the restart of eclipse. Confirm the dialog by clicking on **Yes** and Eclipse restarts.


Software Updates
It is strongly recommended you restart the system for the changes to take effect. For some add-ons, it may be possible to apply the changes you have made without restarting. Would you like to restart now?
Yes
No
Apply Changes

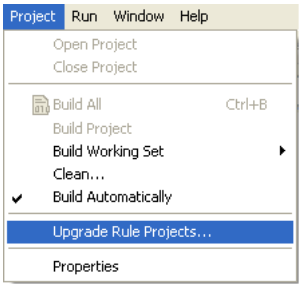
If you need a new license, please save the license file from our e-mail to your hard disk and import the new license file with Visual Rules License Manager. A short dialog will prompt you to restart Visual Rules for the changes to take effect.

4.23. Upgrading Visual Rules Models

Visual Rules introduces some enhancements to the rule model format, when you are upgrading to a higher version of Visual Rules. A dialog will open whenever Visual Rules detects a rule model created with a previous version. You can then choose to automatically upgrade the rule model on the fly. It is recommended to upgrade your rule models all at once after upgrading to a higher version of Visual Rules Modeler (e.g. from 4.2 to 4.3). You should also make sure that all team members are using the same version of Visual Rules Modeler.

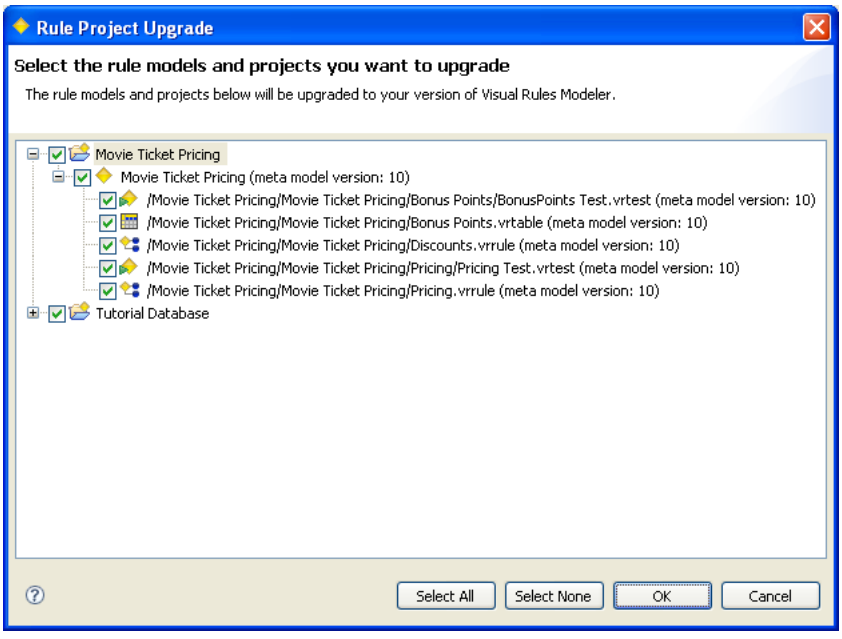
Once, you have successfully upgraded your rule models to a newer version, it is not possible to undo this operation.

1. You can also trigger a rule model upgrade manually using the **Project > Upgrade Rule Projects...** menu entry.

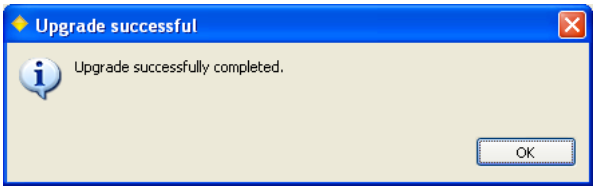


2. Select the rule models you want to upgrade and click on **OK.** It is recommended to upgrade all your rule models.

If any dependencies between models and/or projects exist then it is **required** to upgrade these models and/or projects all at once. Otherwise the dependency information will not be preserved and models and projects possibly no longer work.


Rule Project Upgrade
Select the rule models and projects you want to upgrade
The rule models and projects below will be upgraded to your version of Visual Rules Modeler.
Movie Ticket Pricing
Movie Ticket Pricing (meta model version: 10)
/Movie Ticket Pricing/Movie Ticket Pricing/Bonus Points/BonusPoints Test.vrtest (meta model version: 10)
/Movie Ticket Pricing/Movie Ticket Pricing/Bonus Points.vrtable (meta model version: 10)
/Movie Ticket Pricing/Movie Ticket Pricing/Discounts.vrrule (meta model version: 10)
/Movie Ticket Pricing/Movie Ticket Pricing/Pricing/Pricing Test.vrtest (meta model version: 10)
/Movie Ticket Pricing/Movie Ticket Pricing/Pricing.vrrule (meta model version: 10)
Tutorial Database
Select All
Select None
OK
Cancel

3. After upgrading the rule models, you will get a message that the upgrade has successfully completed.



Chapter 5. Reference

5.1. Perspectives

Perspectives are pre-defined user interface layouts. The following sections describe the perspectives specific to Visual Rules.

5.1.1. Rule Modeling Perspective

The **Rule Modeling** perspective is used for rule modeling tasks. It is divided into four sections. The **Rule Explorer** on the left shows all the projects and the elements contained therein. There are several tabs like the **Properties** view and the **Problems** view at the bottom. The **Properties** view always shows the properties and settings of the currently selected element and the Problems view shows all the warnings and errors in the rule models. The central section shows the active editor. Most of the time the rule editor or the test data editor will be shown here.

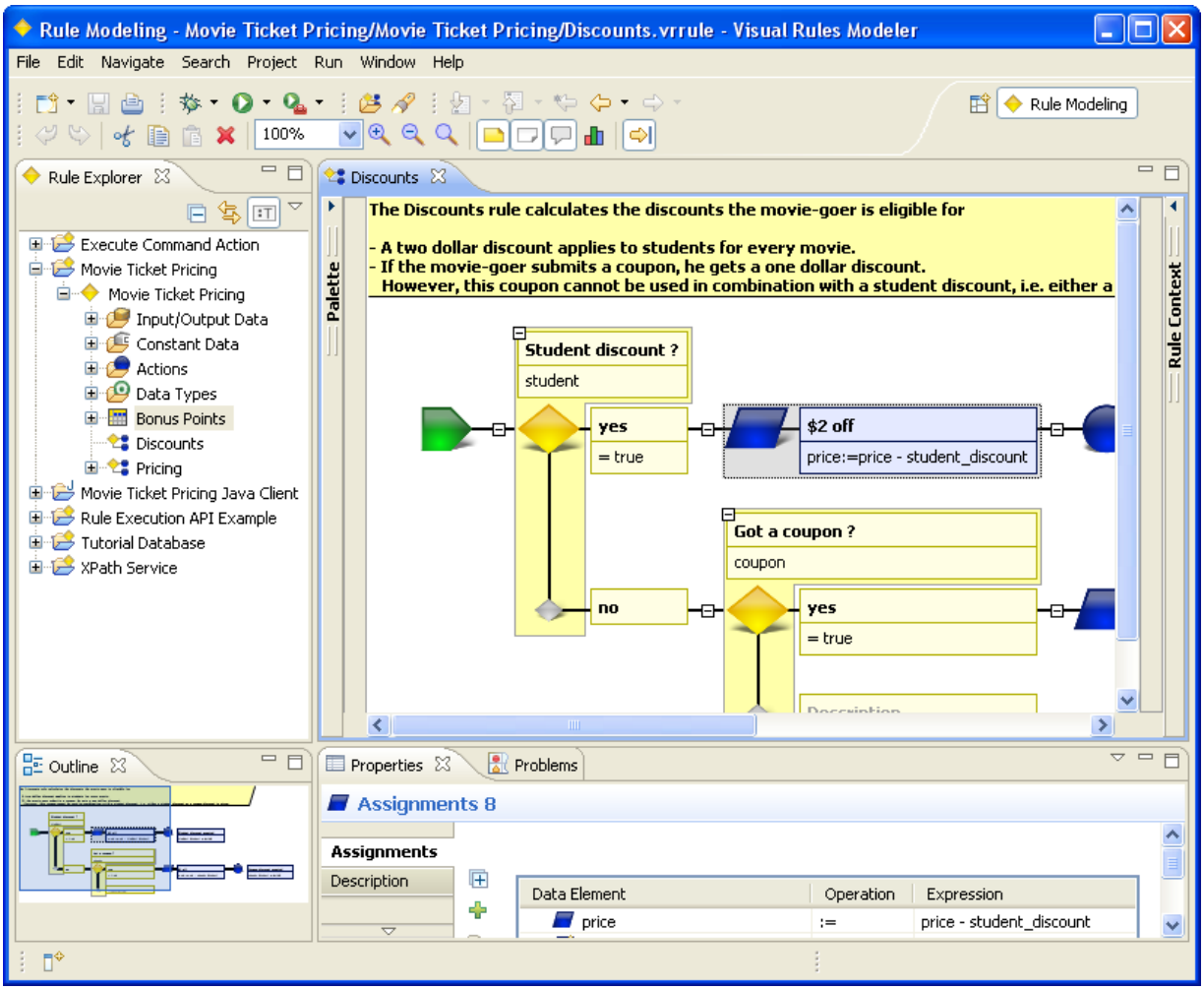


Figure 5.1. Rule Modeling perspective

The **Rule Modeling** perspective focuses on the non-technical aspects of rules and rule models. Consequently, some properties tabs and specific settings relevant for technical users only, are hidden from view.

Related Concepts.

- Section 3.6, “Flow Rule Editor” [45]
- Section 3.8, “Decision Table Editor” [50]

Related References.

- Section 5.1.2, “Rule Integration Perspective” [198]
- Section 5.5.1, “Rule Explorer View” [223]
- Section 5.5.3, “Problems View” [224]
- Section 5.5.6, “Properties View” [226]
- Section 5.5.4, “Outline View” [225]
- Section 5.3.1, “Flow Rule Editor” [205]
- Section 5.3.2, “Decision Table Editor” [207]

5.1.2. Rule Integration Perspective

The **Rule Integration** perspective is meant for developers who integrate rules into an application, connect rules with existing object models or extend Visual Rules with additional functions or actions. In other words, this perspective is used for all the technical tasks. All the technical properties tabs and settings are availabe here, but are hidden from view in the **Rule Modeling** perspective.

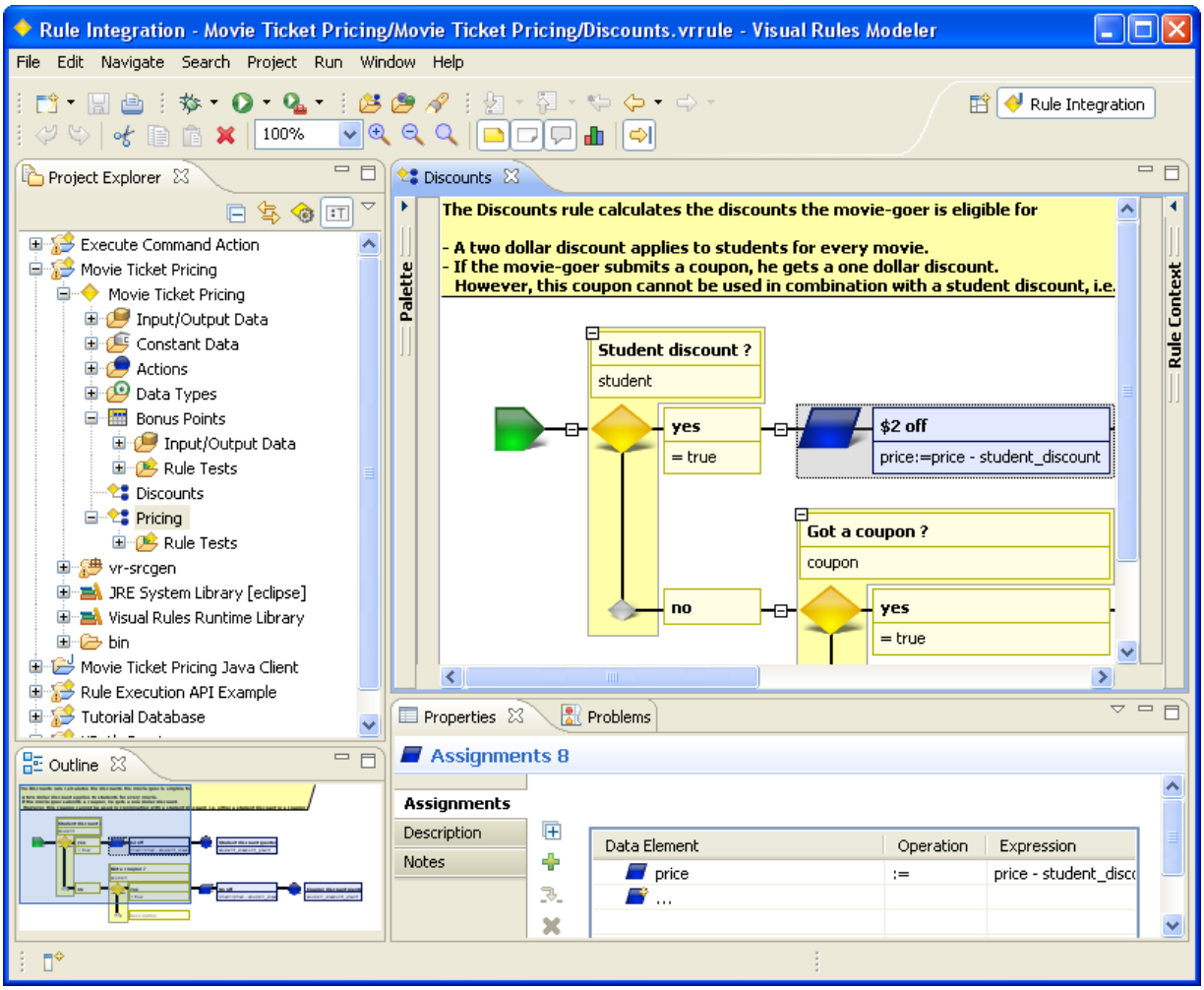


Figure 5.2. Rule Integration perspective

Related Concepts.

- Section 3.6, “Flow Rule Editor” [45]
- Section 3.8, “Decision Table Editor” [50]

Related References.

- Section 5.1.1, “Rule Modeling Perspective” [197]
- Section 5.5.2, “Project Explorer View” [223]
- Section 5.5.3, “Problems View” [224]
- Section 5.5.6, “Properties View” [226]
- Section 5.5.4, “Outline View” [225]
- Section 5.3.1, “Flow Rule Editor” [205]
- Section 5.3.2, “Decision Table Editor” [207]

5.1.3. Debug Perspective

The **Debug** perspective is used during rule debugging. It contains the views **Debug**, **Variables** and **Breakpoints** and is activated automatically when rule execution hits a breakpoint during a debug session.

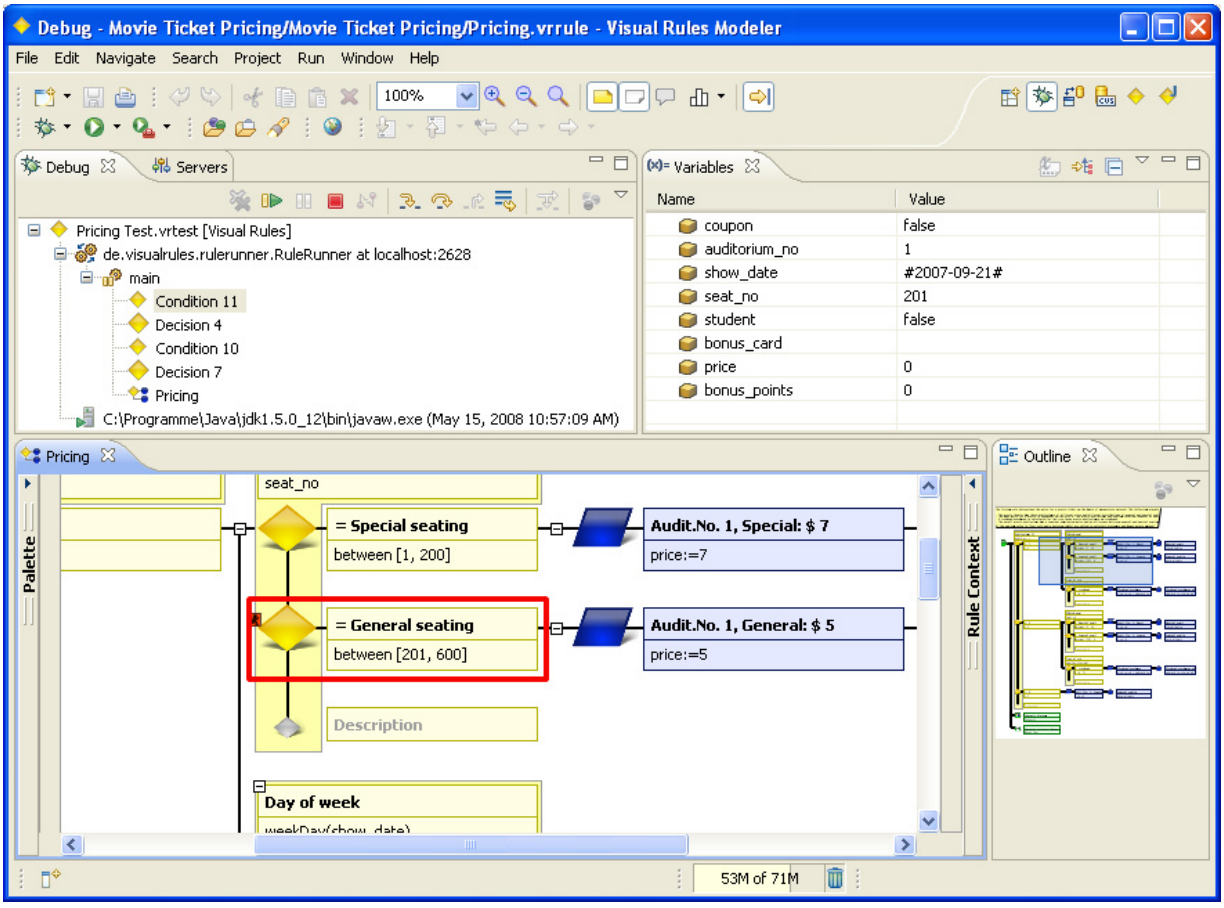


Figure 5.3. Debug perspective

Related Concepts.

- Section 3.23, “Rule Debugging” [87]
- Section 3.23.2, “Breakpoint” [88]
- Section 3.6, “Flow Rule Editor” [45]
- Section 3.8, “Decision Table Editor” [50]

Related Tasks.

- Section 4.13, “Debugging Rules” [175]
- Section 3.8, “Decision Table Editor” [50]

Related References.

- Section 5.5.8, “Debug View” [227]
- Section 5.5.9, “Variables View” [228]
- Section 5.5.10, “Breakpoints View” [229]
- Section 5.3.1, “Flow Rule Editor” [205]
- Section 5.3.2, “Decision Table Editor” [207]

5.2. Wizards

The following sections describe the wizard dialogs to create rule projects, rule models, rules etc.

5.2.1. New Rule Project Wizard

Use this wizard to create a new rule project.

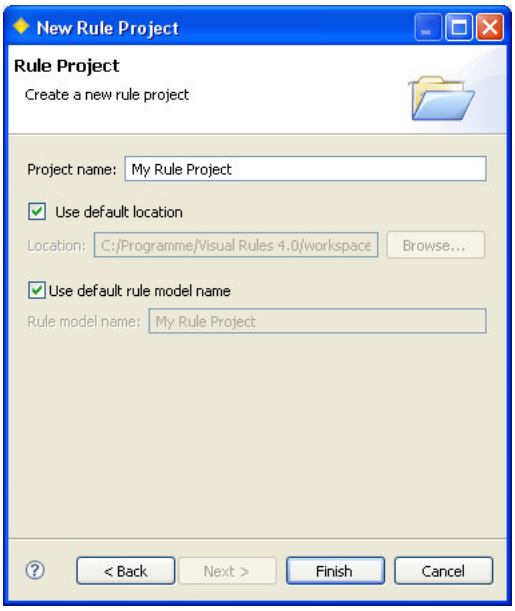


Figure 5.4. New Rule Project wizard

Option	Description
Project name	The name of the project to be created. The name must be different from any project that already exists in the workspace.
Use default location	If checked, the project is created in the current workspace directory, else a different directory may be specified.
Location	This specifies the file system location where the project is created. This can be edited if **Use default location** is unchecked.
Use default rule model name	If checked, the rule model will have the default name, which is the same as the rule project.
Rule model name	This specifies the name of the rule model created within the rule project. This can be edited if **Use default rule model name** is unchecked.

Related tasks.

- Section 4.1.1, “Creating a new Rule Project” [89]

Related concepts.

- Section 3.1, “Rule Project” [25]

5.2.2. New Rule Model Wizard

Use this wizard to create a new rule model.

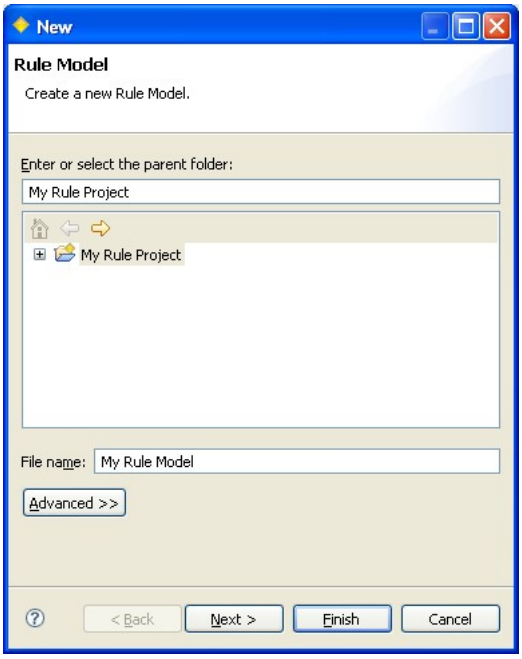


Figure 5.5. New Rule Model wizard

Option	Description
Parent folder	This is the folder within your workspace in which the new rule model will be created. You can browse the workspace and select the parent folder in the navigator below this line.
File name	Enter the name of the rule model to be created. This name will be used both as a file name (with an extension of `.vrmodel`) and for the name of the rule model stored in this file.
Advanced >>	This section allows to link to an existing file somewhere else in your file system. This is an advanced feature of the Eclipse platform and should not be used with Visual Rules. Read more about it in the **New File wizard** section of the **Workbench User Manual**.

Related tasks.

- Section 4.2.1, “Creating a new Rule Model” [93]

Related concepts.

- Section 3.2, “Rule Model” [25]

5.2.3. New Rule Wizard

Use this wizard to create a new rule in an existing rule model or rule package.

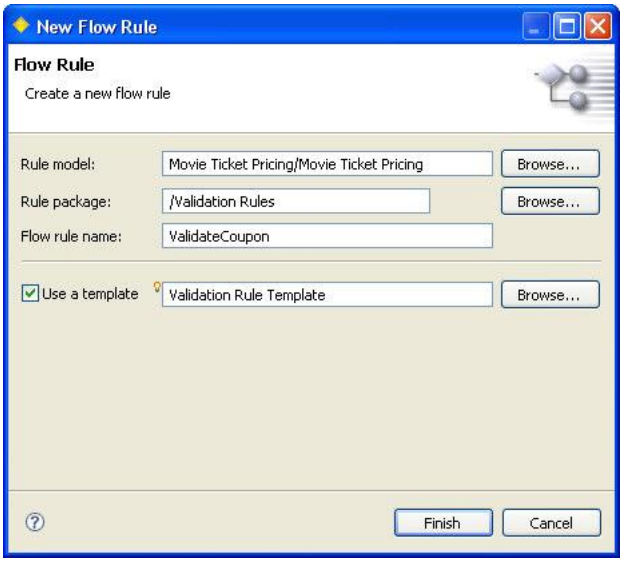


Figure 5.6. New Rule wizard

Option	Description
Rule model	Enter the rule model you want the rule to be added to. Click **Browse** to list all available rule models.
Rule package	Enter the path of the rule package within that rule model you want the rule to be added to. Click **Browse** to list all available rule packages. If this is left empty the rule will be created in the top level rule package (the rule model itself).
Flow rule name	The name of the new flow rule to be created. This must be different from any other rule or rule package in the rule package selected above.
Use a template	Check this to create the new flow rule from a template. Enter the template name, use code assist (**Ctrl**+**Space**) or click **Browse** to list the available templates.

5.2.4. New State Flow Wizard

Use this wizard to create a new state flow in an existing rule model or rule package.

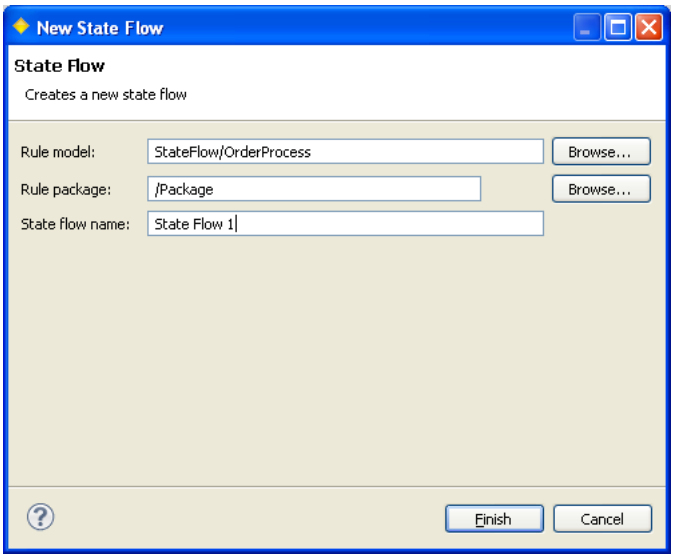


Figure 5.7. New State Flow wizard

Option	Description
Rule model	Enter the rule model you want the state flow to be added to. Click **Browse** to list all available rule models.
Rule package	Enter the path of the rule package within that rule model you want the state flow to be added to. Click **Browse** to list all available rule packages. If this is left empty the state flow will be created in the top level rule package (the rule model itself).
State flow name	The name of the new state flow to be created. This must be different from any other state flow or rule package in the rule package selected above.

5.2.5. New Service Wizard

Use this wizard to create a new service in an existing rule model.

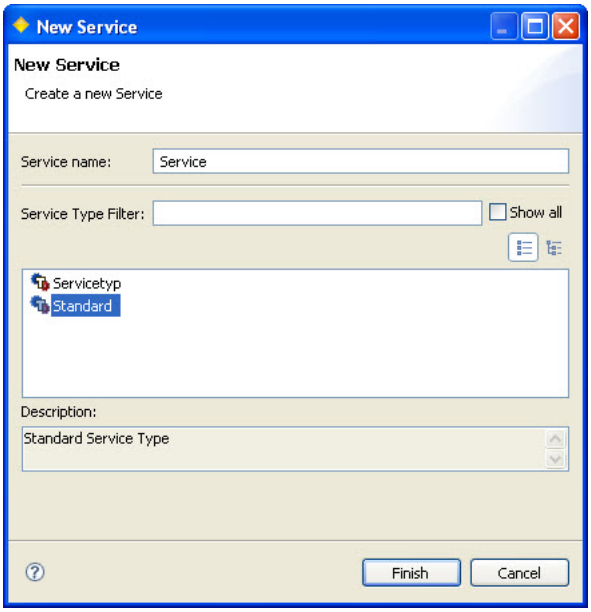


Figure 5.8. New Service wizard

Option	Description
Service name	The name of the new service to be created. This must be different from any other service in the rule and rule package.
Service Type Filter	Enter the beginning of the name of the service type you want to select. This will filter the list so that it only shows elements with matching names. Initially the list will not be filtered. You can use an asterisk `*` to represent any number of characters, e.g. `*Service*Final` will match all names containing both the words `Service` and `Final`. You can use a question mark `?` to represent exactly one character, e.g. `?Service` will match all names containing the word `Service` preceded by exactly one character. Check **Show all** to list all available services.
Service Type	Select from the list the Service Type for the Service to be created.

5.2.6. Generate Documentation Wizard

Use this wizard to generate an HTML documentation for a rule model, rule package, state flow or a single rule.

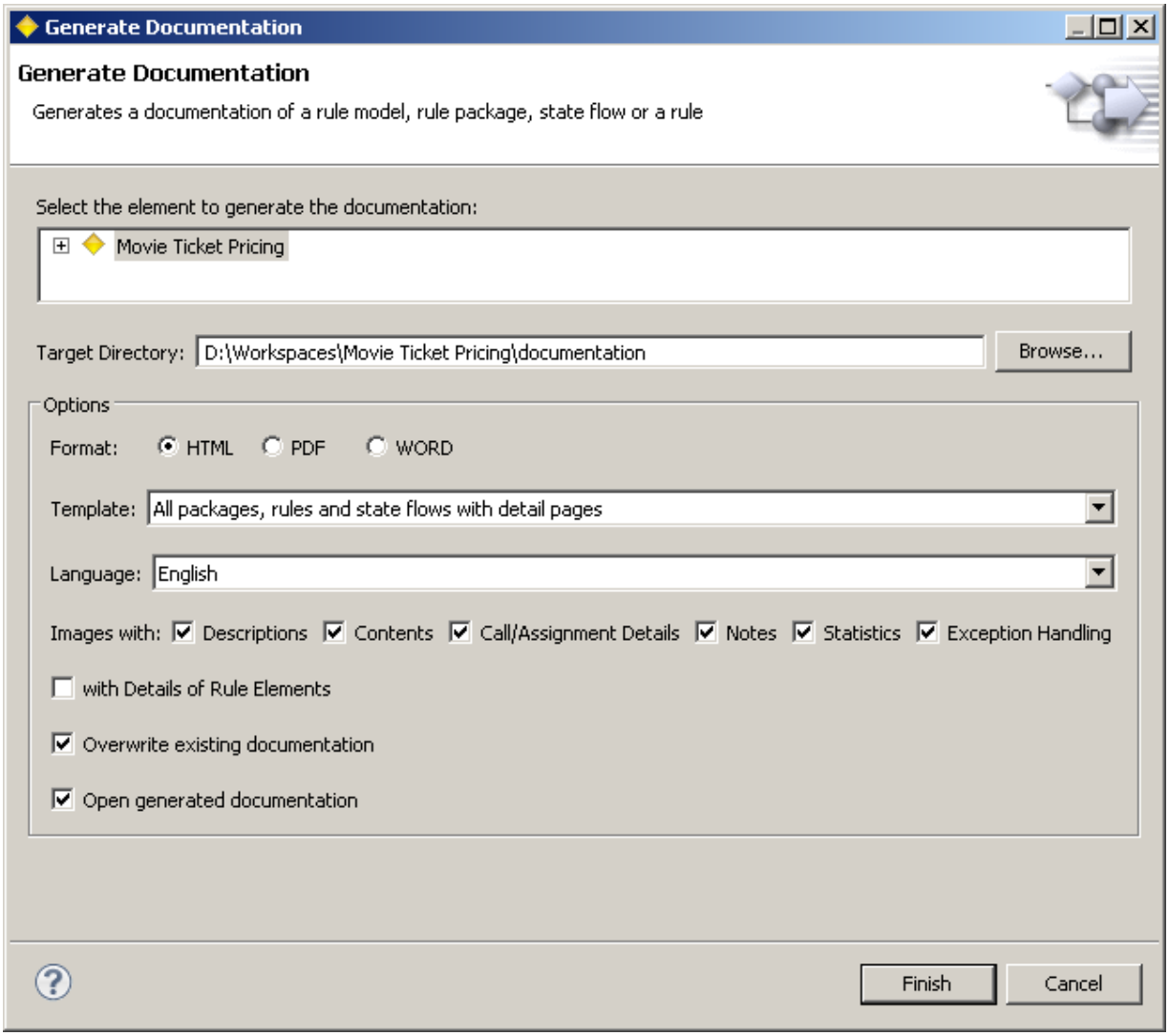


Figure 5.9. Generate Documentation wizard

Option	Description
Select the element to generate the documentation	Here you select the rule model, the rule package, state flow or rule that you want to create the documentation for. If you select a rule model or a rule package, the documentation will include all the sub packages. The selection will be set automatically when a rule model, package, state flow or rule was already selected when the wizard was started. The list only includes rule models that have been opened.
Target Directory	Enter the path of the directory where the generated documentation should go. Click **Browse** to open a file browser.
Format	Either select **HTML** for display in a browser or **PDF** for display in a PDF viewer (for example Adobe Reader).
Template	The report template to use for the generated documentation. This determines what information will be included.
Language	The language of the generated documentation.
Image	Check all the informations that the images of rules should contain. You can select **Descriptions**, **Contents**, **Call/Assignment Details**, **Notes**, **Statistics** and **Exception Handling**.

Option	Description
with Details of Rule Elements	Whether the documentation should include detailed information about individual rule elements.
Overwrite existing documentation	Check to automatically overwrite existing documentation files in the target directory. Otherwise you will get a warning message.
Open generated documentation	Check to automatically open the documentation once generation is finished.

5.3. Editors

The following sections describe the editors for rules, state flows, tests, projects and dependencies between these.

5.3.1. Flow Rule Editor

The flow rule editor is used to view and edit flow rules.

5.3.1.1. Flow Rule Editor Palette

The flow rule editor palette contains all available rule elements that can be added to the rule. Additionally it contains tools for selection, zoom, notes and branch descriptions.

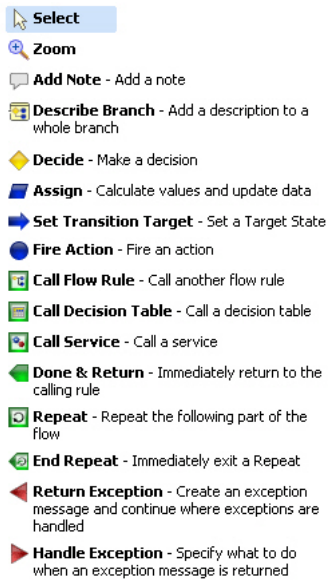

Select
Zoom
Add Note - Add a note
Describe Branch - Add a description to a whole branch
Decide - Make a decision
Assign - Calculate values and update data
Set Transition Target - Set a Target State
Fire Action - Fire an action
Call Flow Rule - Call another flow rule
Call Decision Table - Call a decision table
Call Service - Call a service
Done & Return - Immediately return to the calling rule
Repeat - Repeat the following part of the flow
End Repeat - Immediately exit a Repeat
Return Exception - Create an exception message and continue where exceptions are handled
Handle Exception - Specify what to do when an exception message is returned

Figure 5.10. Rule Editor palette

Palette Item	Description
Select	This is the default tool. Use this to select, move and copy rule elements, descriptions, contents and notes. Double-click on rule elements, descriptions, contents or notes to edit them.
Zoom	This is the zoom tool. Click to zoom in. Press **Shift** and click to zoom out. Draw a rectangle to zoom the enclosed area.
Add Note	Click on a rule element to add another note to this element.
Describe Branch	Click on a rule element to add a description to the branch rooted at that element. This does not work for the start element and for conditions within a decision element.
Decide	Insert a new Decision element or a new condition within an existing decision element.

Palette Item	Description
Assign	Insert a new Assignment element or a new assignment within an existing assignment element.
Set Transition Target	Set a target state for a transition rule This element is available only for transition rules in state flows.
Fire Action	Insert a new Fire Action element.
Call Flow Rule	Insert a new Call Flow Rule element.
Call Decision Table	Insert a new Call Decision Table element.
Call Service	Insert a new Call Service element.
Done & Return	Insert a new Done & Return element.
Repeat	Insert a new Repeat element.
End Repeat	Insert a new End Repeat element.
Return Exception	Insert a new Return Exception element.
Handle Exception	Click on a rule element to add a Handle Exception element to the branch rooted at that element. This does not work for the start element and for conditions within a decision element.

5.3.1.2. Rule Context Palette

The rule context palette is shown on the right side of the rule editor. It displays and gives access to data elements, actions, services and rule tests. These elements are shown within their respective sections. The sections can be collapsed or expanded and pinned open with the little pin symbols.

Double-clicking on an element will open the **Properties** for this element or, in the case of rule tests, start the rule test editor. Clicking on a selected element or pressing **F2** will allow you to rename the element.

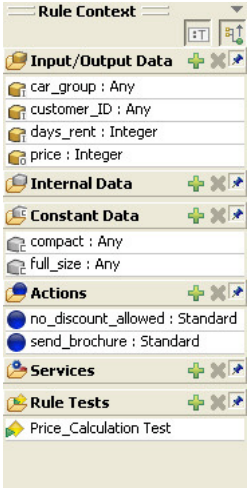


Figure 5.11. Rule Context palette

Palette Item	Description
	This button enables/disables the display of type information for the elements in the palette.

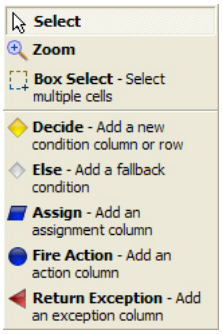
Palette Item	Description
	When this button is not pressed, the palette only shows elements that are defined by the rule itself. When the button is pressed, the palette will show all elements the rule has access to, thus including elements that are defined on the rule packages above or - in the case of services - defined on any reused rule packages. Elements not defined by the rule itself are displayed with a grey background.
	These buttons add a new element into the corresponding section, e.g. a new internal data element or a new rule test.
	These buttons delete the currently selected element. They only activate when an element is selected.
	Sections can be pinned open with these little pin buttons. This will prevent the section from collapsing automatically to make room for others.
Input/Output Data	This section displays all the input/output data elements available to the rule.
Internal Data	This section displays all the internal data elements available to the rule.
Constant Data	This section displays all the constant data elements available to the rule.
Actions	This section displays all the actions available to the rule.
Services	This section displays all the services available to the rule.
Rule Tests	This section displays all the rule tests defined for the rule.

5.3.2. Decision Table Editor

The decision table editor is used to view and edit decision tables.

5.3.2.1. Decision Table Editor Palette

The decision table editor palette contains all available elements that can be added to the decision table. Additionally it contains tools for selections and zoom.


Select
Zoom
Box Select - Select multiple cells
Decide - Add a new condition column or row
Else - Add a fallback condition
Assign - Add an assignment column
Fire Action - Add an action column
Return Exception - Add an exception column

Palette Item	Description
Select	This is the default tool. Use this to select, move and copy elements of the decision table. Double-click on cells to edit them.
Zoom	This is the zoom tool. Click to zoom in. Press **Shift** and click to zoom out. Draw a rectangle to zoom the enclosed area.
Box Select	This allows to make rectangular selections of cells.
Decide	Inserts a new decision column or row. Decision columns are added at the left side of the decision tables, while decision rows are at the top of the table.
Assign	Inserts a new assignment column. Assignment columns are used to assign values to output data elements. These are then the result of the decision table.
Fire Action	Inserts a new action column. These are used to fire Visual Rules actions of any type.
Return Exception	Inserts a new exception column. These are used to return exceptions to the caller of the decision table to signal error conditions.

Figure 5.12. Decision Table Editor palette

5.3.2.2. Rule Context Palette

The rule context palette is shown on the right side of the decision table editor. It displays and gives access to data elements, actions and rule tests. These elements are shown within their respective sections. The sections can be collapsed or expanded and pinned open with the little pin symbols.

Double-clicking on an element will open the **Properties** for this element or, in the case of rule tests, start the rule test editor. Clicking on a selected element or pressing **F2** will allow you to rename the element.

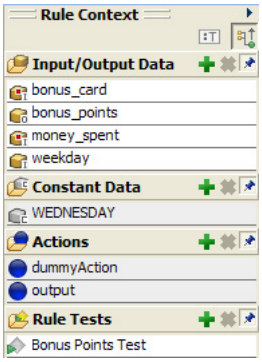


Figure 5.13. Rule Context palette

Palette Item	Description
	This button enables/disables the display of type information for the elements in the palette.

Palette Item	Description
	When this button is not pressed, the palette only shows elements that are defined by the decision table itself. When the button is pressed, the palette will show all elements the decision table has access to, thus including elements that are defined on the rule packages above. Elements not defined by the decision table itself are displayed with a grey background.
	These buttons add a new element into the corresponding section, e.g. a new input data element or a new rule test.
	These buttons delete the currently selected element. They only activate when an element is selected.
	Sections can be pinned open with these little pin buttons. This will prevent the section from collapsing automatically to make room for others.
Input/Output Data	This section displays all the input/output data elements available to the decision table.
Constant Data	This section displays all the constant data elements available to the decision table.
Actions	This section displays all the actions available to the decision table.
Rule Tests	This section displays all the tests defined for the decision table.

5.3.3. State Flow Editor

The state flow editor is used to view and edit state flows.

5.3.3.1. State Flow Editor Palette

The state flow editor palette contains all available state flow elements that can be added to the state flow. Additionally it contains tools for selection, zoom and notes.

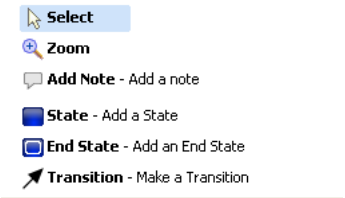


Figure 5.14. State flow Editor palette

Palette Item	Description
Select	This is the default tool. Use this to select, move and copy state flow elements, descriptions, contents and notes. Double-click on state flow elements, descriptions, contents or notes to edit them.
Zoom	This is the zoom tool. Click to zoom in. Press **Shift** and click to zoom out. Draw a rectangle to zoom the enclosed area.
Add Note	Click on a state flow element to add another note to this element.
State	Insert a new state element.
End State	Insert a new end state element.
Transition	Insert a new transition.

5.3.3.2. State Flow Context Palette

The state flow context palette is shown on the right side of the state flow editor. It displays and gives access to all the input/output data elements available to the state flow. It can be collapsed or expanded.

Double-clicking on an element will open the **Properties** for this element. Clicking on a selected element or pressing **F2** will allow you to rename the element.

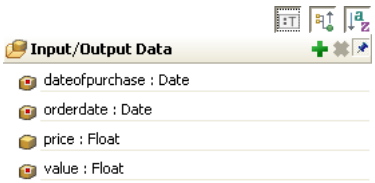


Figure 5.15. State flow Context palette

Palette Item	Description
	This button enables/disables the display of type information for the elements in the palette.
	When this button is not pressed, the palette only shows elements that are defined by the state flow itself. When the button is pressed, the palette will show all elements the state flow has access to, thus including elements that are defined on the rule packages above. Elements not defined by the state flow itself are displayed with a grey background.
	The button adds a new data element.
	The button deletes the currently selected data element. It only activates when a data element is selected.
	The section can be pinned open with this little pin button.

5.3.4. Rule Test Editor

The rule test editor allows you to set the input parameters for a rule execution and verify that the resulting output data is what you expect. The editor has two pages that you can switch using the tab bar at the bottom. One for configuring the rule execution and one for editing your actual test data.

The title of the rule editor always shows the name of the rule being tested and its path.

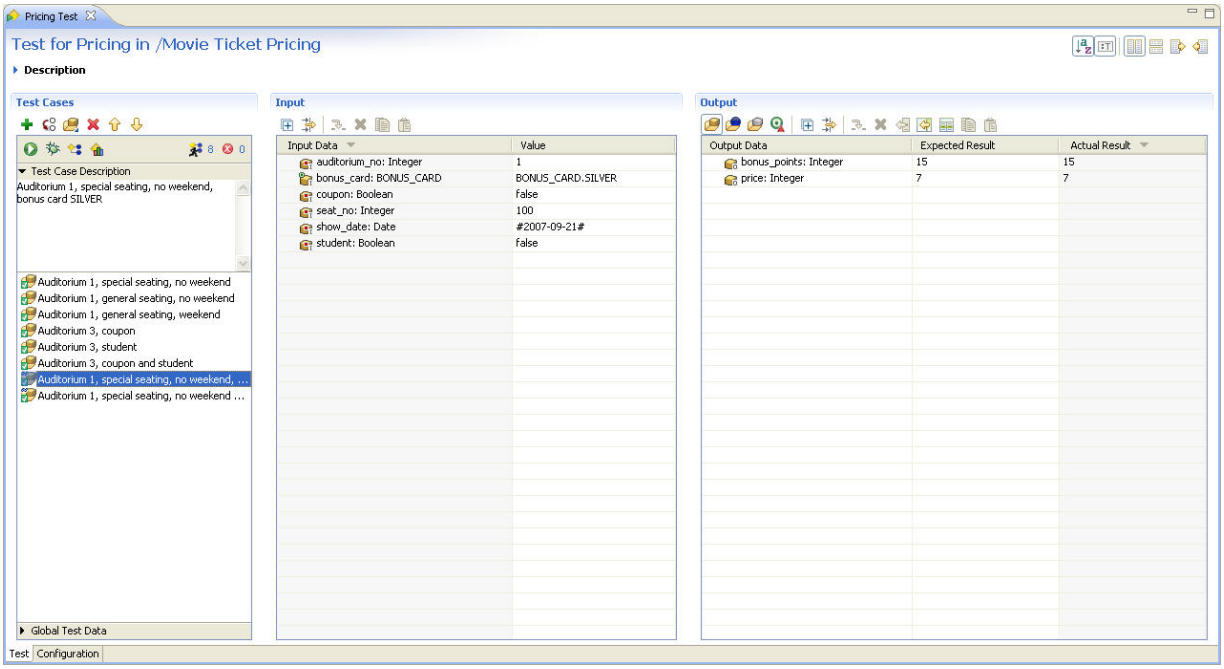


Figure 5.16. Rule Test editor

Test editor element	Description
	Toggles the alphabetical sorting of the data in **Input** and **Output**.
	Determines, whether or not type information is displayed for the data in **Input** and **Output.**
	Arranges the **Test Cases**, **Input** and **Output** panels next to each other. This is the default.
	Arranges the **Input** and **Output** panels vertically on top of each other.
	Hides the **Output** panel and shows only the **Input** panel.
	Hides the **Input** panel and shows only the **Output** panel.
Description	Clicking here will open a text field where you can enter a description for this test.

Related Concepts.

- Section 3.22, “Rule Testing” [82]

5.3.4.1. Test Cases

This panel shows the test cases defined in this rule test.

Test editor element	Description
	Add another test case.
	Duplicate the selected test case including all its input data and expected values.
	Import test cases.
	Delete the selected test case.
	Move the selected test case one position up.

Test editor element	Description
	Move the selected test case one position down.
	Execute the test. This will start the whole test and execute all test cases defined in this test. If code needs to be generated before execution or if errors exist in the rule model, you will be asked how to proceed.
	Execute the test in debug mode. Test execution will halt when a breakpoint is reached.
or	Opens the editor for the flow rule or decision table being tested
	Shows the corresponding result file in the rule explorer
	The number next to this icon indicates the number of successful test cases in this test for the last execution.
	The number next to this icon indicates the number of failed test cases in this test for the last execution.
Test Case Description	This section contains a description for the currently selected test case. It can be expanded and collapsed.
Global Test Data	This section gives access to the initial data setup where static internal data elements can be initialized before the test cases are executed.

5.3.4.2. Input

This panel shows all the input data possible for the rule and allows you to assign values to the input data for each test case.

Test editor element	Description
	Expands all elements that have children to show every element in the tree.
	Hides the input parameters that are not used, i.e. don't have a value assigned to them in the **Input** panel.
	Inserts a new element into the list element selected in the **Input** panel.
	Deletes the selected list element.

5.3.4.3. Output

This panel shows all the output data, actions and internal data for the rule and allows you to set expected results for these. It also shows the actual results for the last test run right next to it so you can easily see the results of the test execution.

Test editor element	Description
	Pressing this button will show the input/output data elements in the **Output** panel.
	Pressing this button will show the actions in the **Output** panel. You will be able to see which actions fired and which did not.
	Pressing this button will show the internal data elements in the **Output** panel.
	Pressing this button will show the expected exception in the **Output** panel.
	Expands all elements that have children to show every element in the tree.

Test editor element	Description
	Hides the input parameters that are not used i.e. don't have a value assigned to them in the **Output** panel.
	Inserts a new element into the list element selected in the **Output** panel.
	Deletes the selected list element.
	Copies the currently selected result values to the expected result column.
	Copies all result values to the expected result column.
	Opens the **Compare Results Dialog**.

5.3.5. Test Suite Editor

The test suite editor allows you to group and execute existing rule tests together in a test suite. It has a bar that visualizes the progression of the test execution. A green bar indicates that all tests passed while a red bar shows that at least one of the executed rule tests failed.

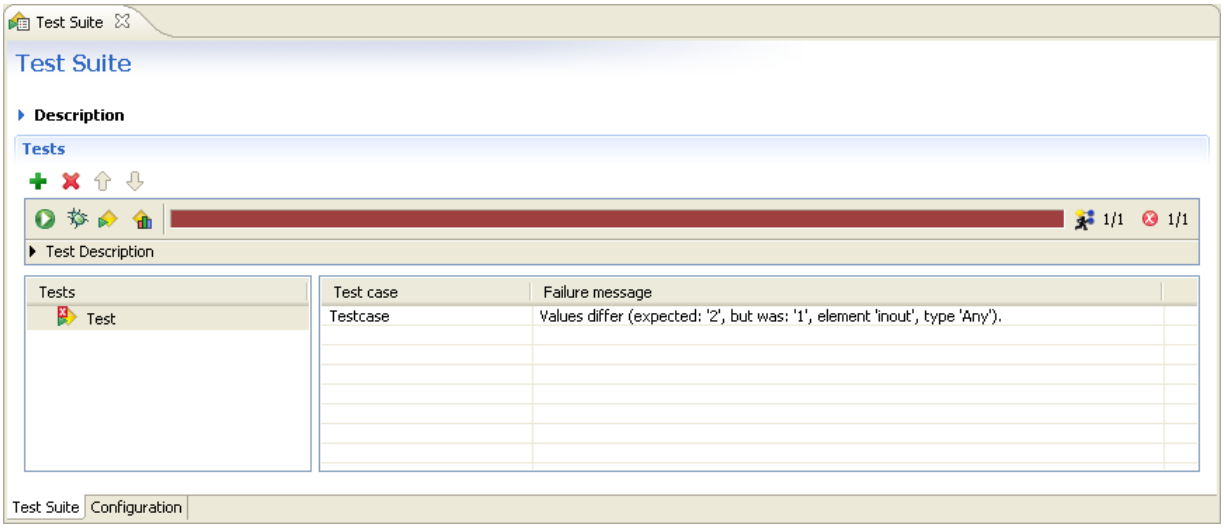


Figure 5.17. Test Suite Editor

Test Suite editor element	Description
	Add another test. This can either be a rule test or a nested test suite.
	Delete the selected test. Only available for top level tests.
	Move the selected test one position up. Only available for top level tests.
	Move the selected test one position down. Only available for top level tests.
	Execute the test suite. This will execute all tests one after another, updating the progress bar and the failure messages table.
	Execute the test suite in debug mode. Test execution will halt when a breakpoint is reached.
	Open an editor for the selected rule test.

Test Suite editor element	Description
	Shows the corresponding result file in the rule explorer
Description	Clicking here will open a text field where you can enter a description for this test suite.
Test Description	Clicking here will open a text field displaying the description for the selected test. In order to edit it, the test's editor can be opened by double-clicking.

Related Concepts.

- Section 3.22, “Rule Testing” [82]

5.3.6. Rule Project Editor

The rule project editor is used to edit the contents of the `ruleproject.vr` file. Here you specify the rule project identifiers and the rule project dependencies.

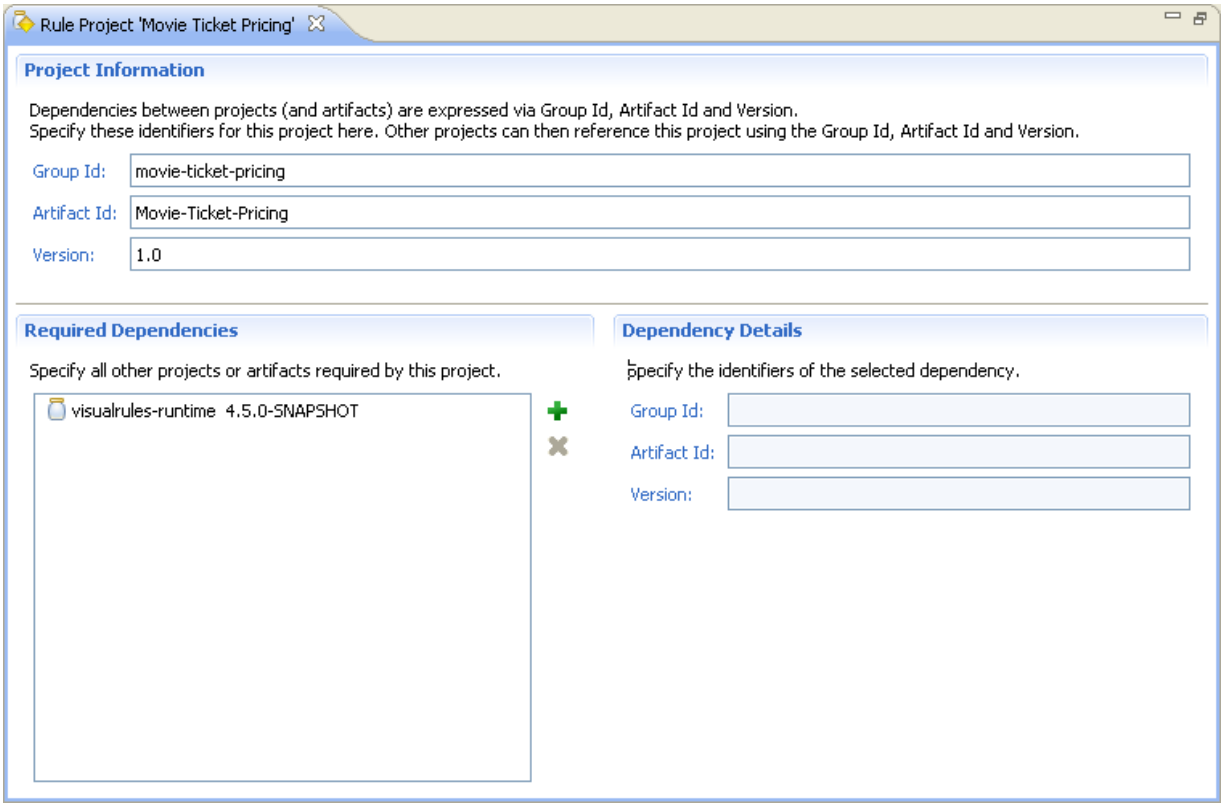

Rule Project 'Movie Ticket Pricing'
Project Information
Dependencies between projects (and artifacts) are expressed via Group Id, Artifact Id and Version.
Specify these identifiers for this project here. Other projects can then reference this project using the Group Id, Artifact Id and Version.
Group Id:
movie-ticket-pricing
Artifact Id:
Movie-Ticket-Pricing
Version:
1.0
Required Dependencies
Specify all other projects or artifacts required by this project.
visualrules-runtime 4.5.0-SNAPSHOT
Dependency Details
Specify the identifiers of the selected dependency.
Group Id:
Artifact Id:
Version:

Figure 5.18. Rule Project Editor

Rule Project Editor element	Description
	Opens the Dialog **Select Dependency** to add a dependency to the current rule project.
	Removes the selected dependency from the rule project.

Related Concepts.

- Section 3.1, “Rule Project” [25]

Related Tasks.

- Section 4.1.2, “Setting Rule Project Identifiers (Group Id, Artifact Id, Version)” [89]

- Section 4.1.3, “Defining Rule Project Dependencies” [90]

Related References.

- Section 5.4.7, “Select Dependency Dialog” [221]

5.3.7. Dependency Diagram Editor

The **Dependency Diagram Editor** is used to analyze dependencies within a rule project. These can be the following kinds of dependencies:

- Rule Package reuses
- Rule calls
- Enclosure of elements
- Testing and Test calls

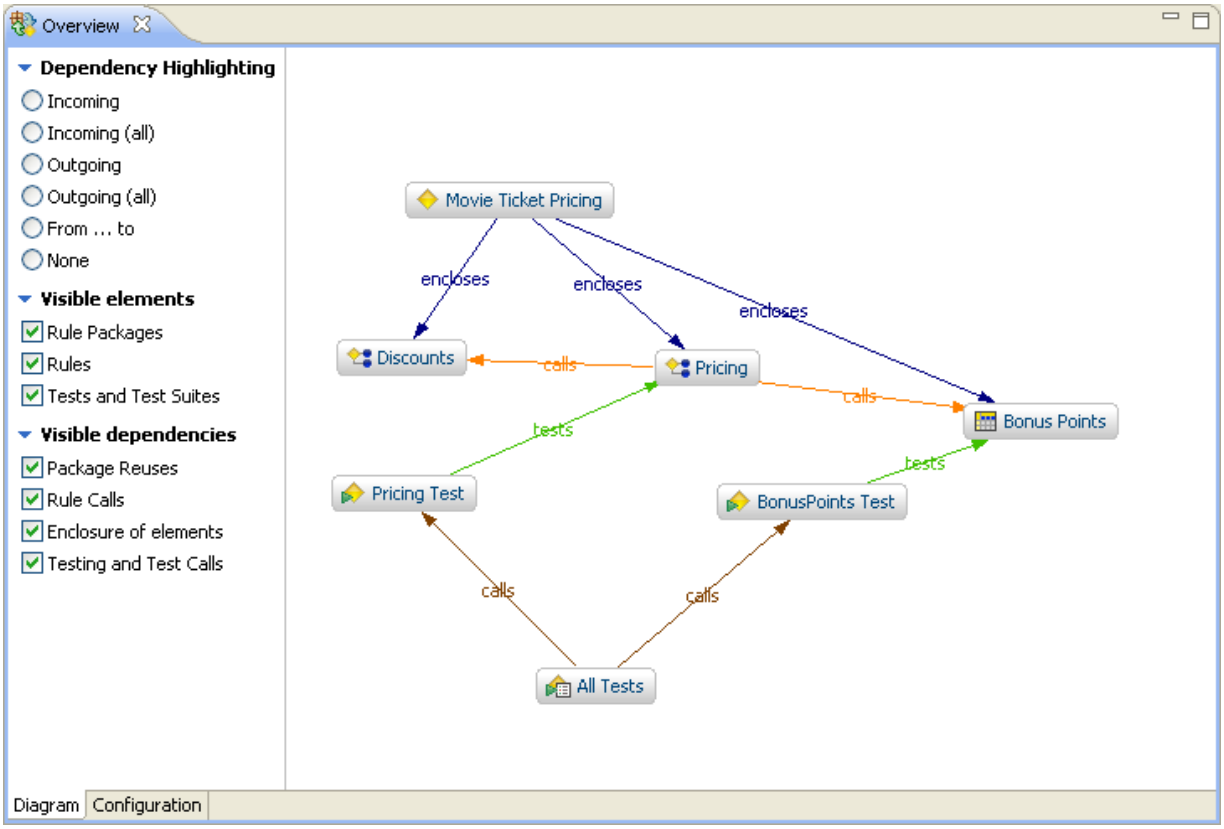


Figure 5.19. Dependency Diagram Editor

Option	Description
Dependency Highlighting	Kind of dependencies, which are highlighted (with respect to a selected element)
Visible elements	Kinds of elements which are visible. Elements of all other kinds are hidden.
Visible dependencies	Kinds of dependencies is visible. Dependencies of all other kinds are hidden.

A detected cycle in the reuses of Rule Packages is marked with a warning icon (⚠).

For a clear view elements can be moved within the editor by drag&drop. Double-clicking on a rule or test opens that element in the respective editor. Double-clickting on a rule call opens the calling rule

in the **Flowrule Editor** and there selects the relevant rule element **Call Flow Rule** or **Call Decision Table**, respectively. Deleting an element (via the conext menu) applies to the editor only.

Related Tasks.

- Section 4.1.4.1, “Visualizing Dependencies between the Elements within a Rule Project” [92]

5.3.8. Usage Matrix Editor

The **Usage Matrix Editor** is used to analyze the usage of elements within a rule project. For each data element, action, etc. within a rule project it shows, in which context it is used and how many times it is used there. Here also those elements can be considered, which are defined outside of the rule project (i.e. in other projects or libraries, which the rule project depends upon).

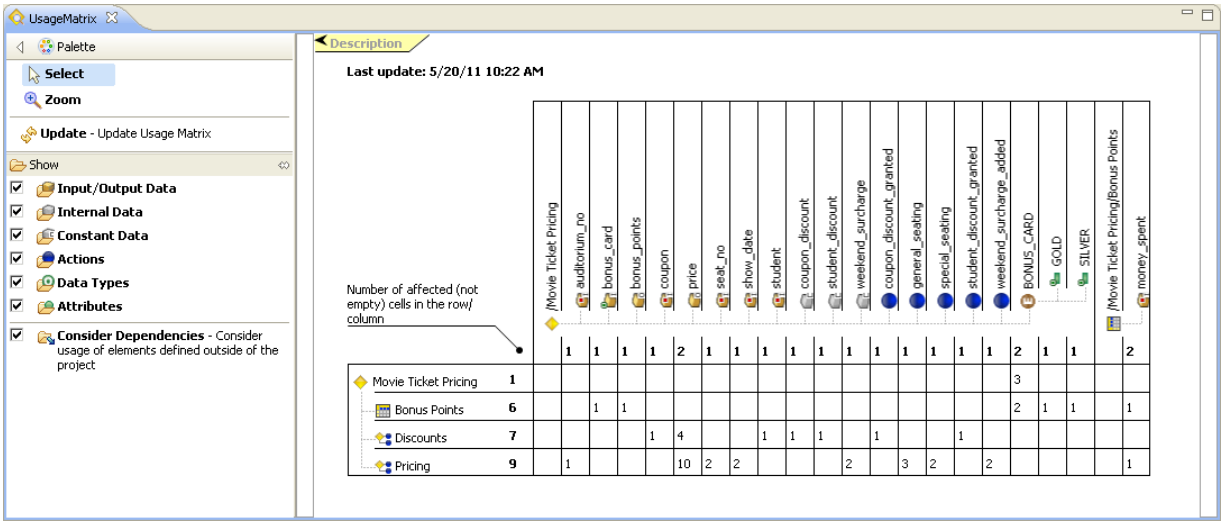


Figure 5.20. Usage Matrix Editor

Related Tasks.

- Section 4.1.4.2, “Visualizing the Usage of Elements within a Rule Project” [93]

5.4. Dialogs

The following sections describe various dialogs within Visual Rules.

5.4.1. Open Rule Dialog

This dialog lists all the rules from all rule models in your workspace.

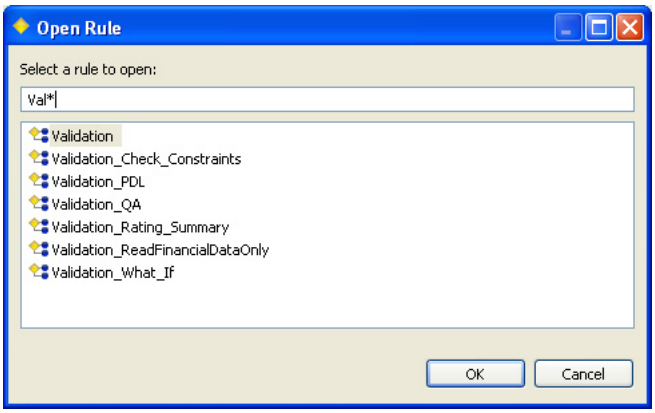


Figure 5.21. Open Rule dialog

Option	Description
Select a rule to open	Enter the beginning of the name of the rule you want to open. This will filter the list so that it only shows rules with matching names. If nothing is entered, the list will show all rules. You can use an asterisk `*` to represent any number of characters, e.g. `*Score*Final` will match all rules whose name contains both the words `Score` and `Final`. You can use a question mark `?` to represent exactly one character, e.g. `?Category` will match all rules whose name contains the word `Category` preceded by exactly one character.

Related Concepts.

- Section 3.4, “Flow Rule” [29]
- Section 3.6, “Flow Rule Editor” [45]

5.4.2. Open Rule Test Dialog

This dialog makes it possible to quickly open a rule test or a test suite by it's name. After it has been opened, the dialog shows all rule tests in the workspace. When a rule test is selected, the name of the rule being tested (including rule model name and packages) is displayed at the bottom of the dialog. This helps to distinguish between tests with the same name. In order to select from test suites instead of rule tests, the test suite icon must be clicked.

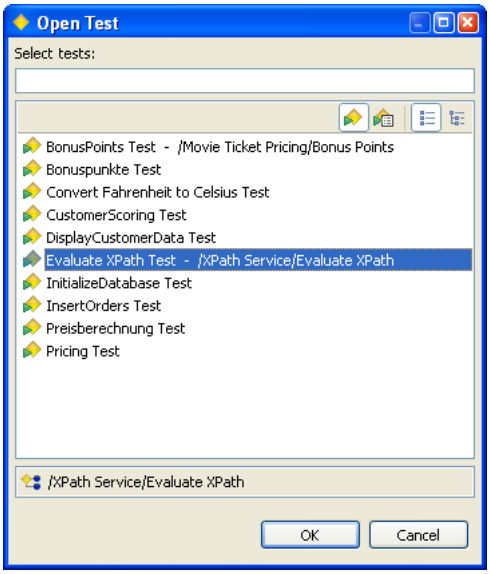


Figure 5.22. Open Rule Test dialog

Option	Description
Select a rule test to open	Enter the beginning of the name of the rule test or test suite you want to open. This will filter the list or the tree so that it only shows tests with matching names. If nothing is entered, the list will show all tests in the workspace. You can use an asterisk `*` to represent any number of characters, e.g. `*Score*Final` will match all tests whose name contains both the words `Score` and `Final`. You can use a question mark `?` to represent exactly one character, e.g. `?Category` will match all tests whose name contains the word `Category` preceded by exactly one character.

Icon	Description
	Displays rule tests, no test suites.

Icon	Description
	Displays test suites, no rule tests.

Icon	Description
	Displays the tests in a flat list, sorted alphabetically. Use this if you know the name of the test.
	Displays the tests within the rule model and rule package hierarchy. Use this if you know where the test can be found.

Related Concepts.

- Section 3.22, “Rule Testing” [82]

5.4.3. Auto Creation Dialog

The Auto Creation dialog informs the user about new rule model elements that Visual Rules wants to create automatically because they don't exist yet.

Visual Rules tries to find the correct data type for the data element that should be created depending on the expression in which it is used. If no data type could be identified, the `Any` data type is used.

It is possible to configure for which elements this dialog for automatic creation should appear. Click on **Configure** to bring up the user preferences for Auto Creation or open it with **Window > Preferences ... > Visual Rules > Auto Creation** and set the elements that should be created automatically to **Prompt**.

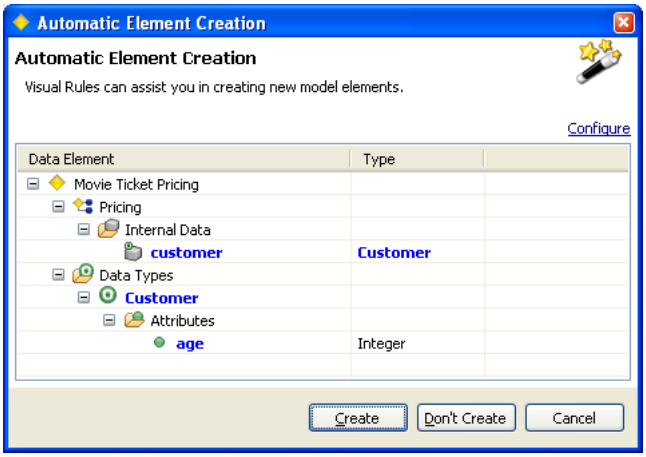


Figure 5.23. Auto Creation dialog

Decide if Visual Rules should create these elements for you and click **Create**, **Don't Create** or **Cancel** respectively.

Related Concepts.

- Section 3.21, “Auto Creation” [82]

Related Tasks.

- Section 4.10.3, “Working with Auto Creation” [159]

Related References.

- Section 5.7.3, “Auto Creation Preferences” [264]

5.4.4. Select Dialog

The **Select** dialog is used to select rule model elements. It appears whenever you click on any of the **...** browse buttons found in many places, e.g. when you select a data type for a data element, the action to fire in a Fire Ac-

tion element or a rule in a Call Flow Rule element. The dialog is also available via the **Select...** context menu entry wherever rule expressions are entered.

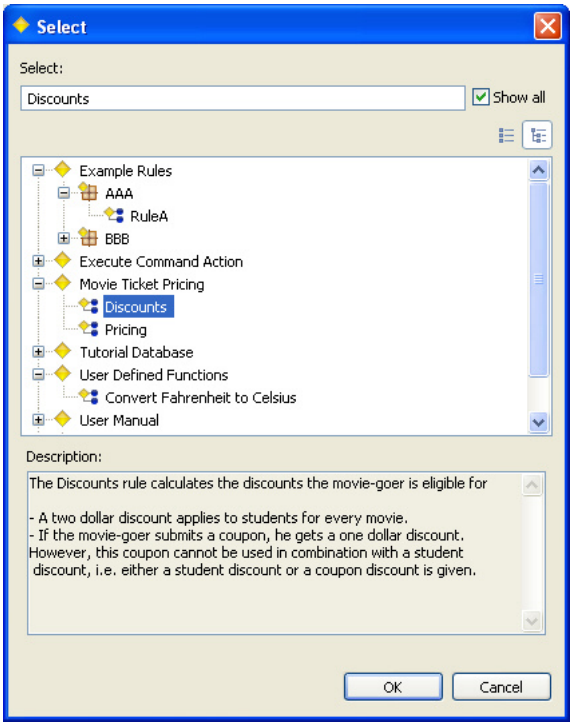


Figure 5.24. Select Dialog

Option	Description
Select	Enter the beginning of the name of the element you want to select. This will filter the list so that it only shows elements with matching names. Initially the list will not be filtered. You can use an asterisk `*` to represent any number of characters, e.g. `*Score*Final` will match all names containing both the words `Score` and `Final`. You can use a question mark `?` to represent exactly one character, e.g. `?Category` will match all names containing the word `Category` preceded by exactly one character.
Show all	Initially the dialog will only show those elements that are accessible from the rule or rule package you are currently editing. When you activate the **Show all** checkbox, the dialog will show all elements from all rule models in your workspace. When you now select an element that was not previously visible, and click **OK**, the **Select** dialog will also add the newly referenced rule package to the **Reuse Packages** tab of the current package. This helps to save a lot of manual steps when reusing rules, types or else from other rule packager or rule models. The **Show all** checkbox will not be available when the type of element to be selected cannot be reused, e.g. data elements and actions.

Icon	Description
	Displays the elements in a flat list, sorted alphabetically. Use this if you know the name of the element.
	Displays the elements within the rule model and rule package hierarchy. Use this if you know where the element can be found.

Related Tasks.

- Section 4.10, “Working with Expressions” [157]

Related References.

- Section 5.6.2.4, “Fire Action Tab” [234]
- Section 5.6.2.5, “Call Flow Rule” [234]
- Section 5.6.2.6, “Call Decision Table” [235]
- Section 5.6.2.7, “Call Service” [236]
- Section 5.6.2.9, “Return Exception Tab” [239]
- Section 5.6.7.2, “Action Settings Tab” [249]

5.4.5. Rule Search Dialog

This dialog is used to search for specific elements of rule models.

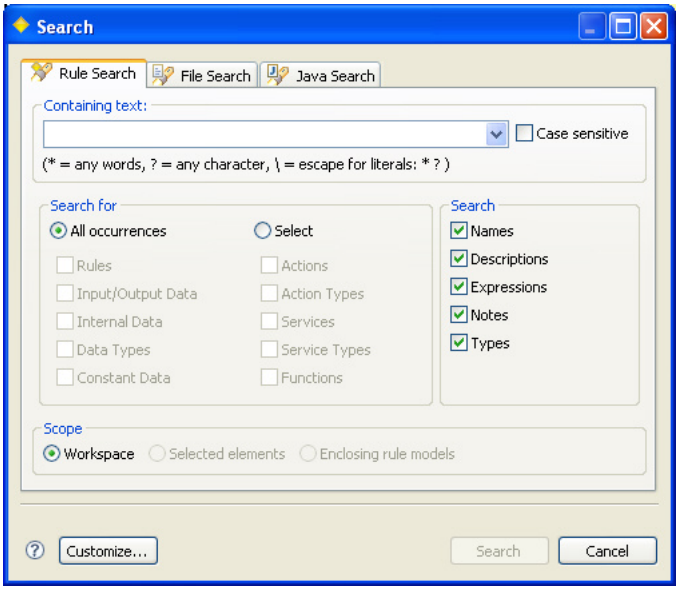


Figure 5.25. Rule Search dialog

Option	Description
Containing text	The text to search for.
Case sensitive	When checked the search will only match if the text is found in exactly the same case. Otherwise it doesn't matter if the text is using upper or lowercase letters.
Search for	Determines which types of rule model elements should be found. • **All occurrences** will find any kind of element • **Select** will find only those kinds of elements that have been checked The checkbox **Rules** includes flow rules, decision tables and all their contents (rule elements, cells)
Search	Determines in which part of an element the text must be found to cause a match. • **Names** will search in element names • **Descriptions** will search in element descriptions • **Expressions** will search in rule expressions • **Notes** will also search in notes

Option	Description
Scope	Determines which rule models or which parts of rule models are searched. • **Workspace** will search all rule models in your workspace • **Selected elements** will limit the search to those rule models, rule packages or rules that are currently selected. This option is only available if a suitable selection was done before the dialog was opened • **Enclosing rule models** will search all of the rule models for which one element contained within was selected. This option is only available if a suitable selection was done before the dialog was opened

5.4.6. Compare Results Dialog

This dialog allows to compare the expected with the actual result within the test editor.

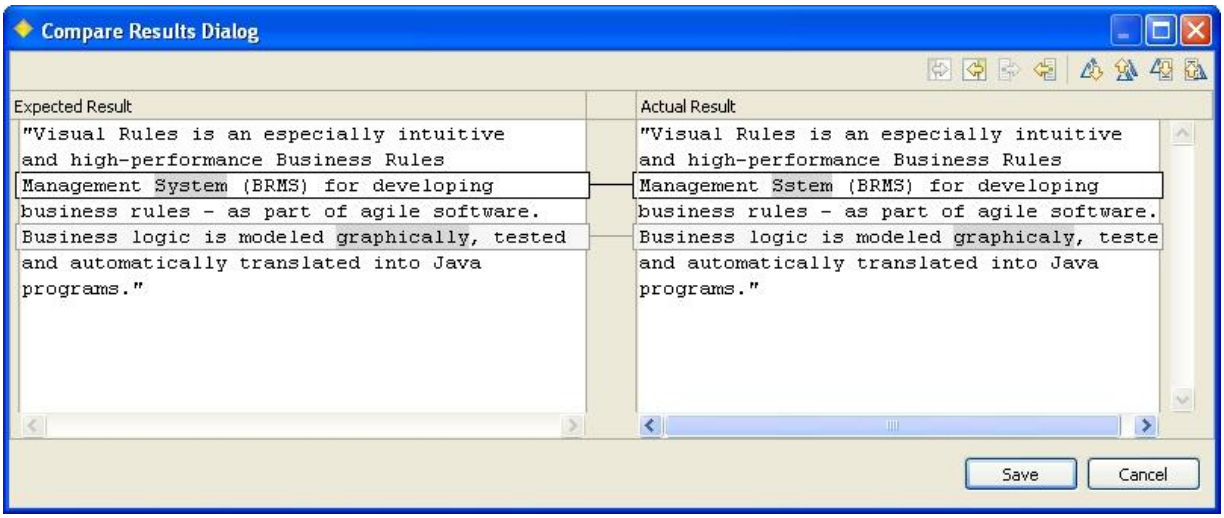

Compare Results Dialog
Expected Result
"Visual Rules is an especially intuitive
and high-performance Business Rules
Management System (BRMS) for developing
business rules - as part of agile software.
Business logic is modeled graphically, tested
and automatically translated into Java
programs."
Actual Result
"Visual Rules is an especially intuitive
and high-performance Business Rules
Management Sstem (BRMS) for developing
business rules - as part of agile software.
Business logic is modeled graphicaly, teste
and automatically translated into Java
programs."
Save
Cancel

Figure 5.26. Compare Results Dialog

Button	Description
	Copy all changes from actual to expected result.
	Copy currently highlighted changes from actual to expected result.
	Jumps to the next different line.
	Jumps to the previous different line.
	Jumps to the next individual change.
	Jumps to the previous individual change.

5.4.7. Select Dependency Dialog

The **Select Dependency** Dialog is used to select and add dependencies to a rule project. The dialog is accessible via the **Rule Project Editor**. The **Select Dependeny Dialog** lists all rule projects in the workspace and all libraries that are known by Visual Rules like the Visual Rules Runtime library. New (currently unknown) libraries can be added by clicking the button **Other...**.

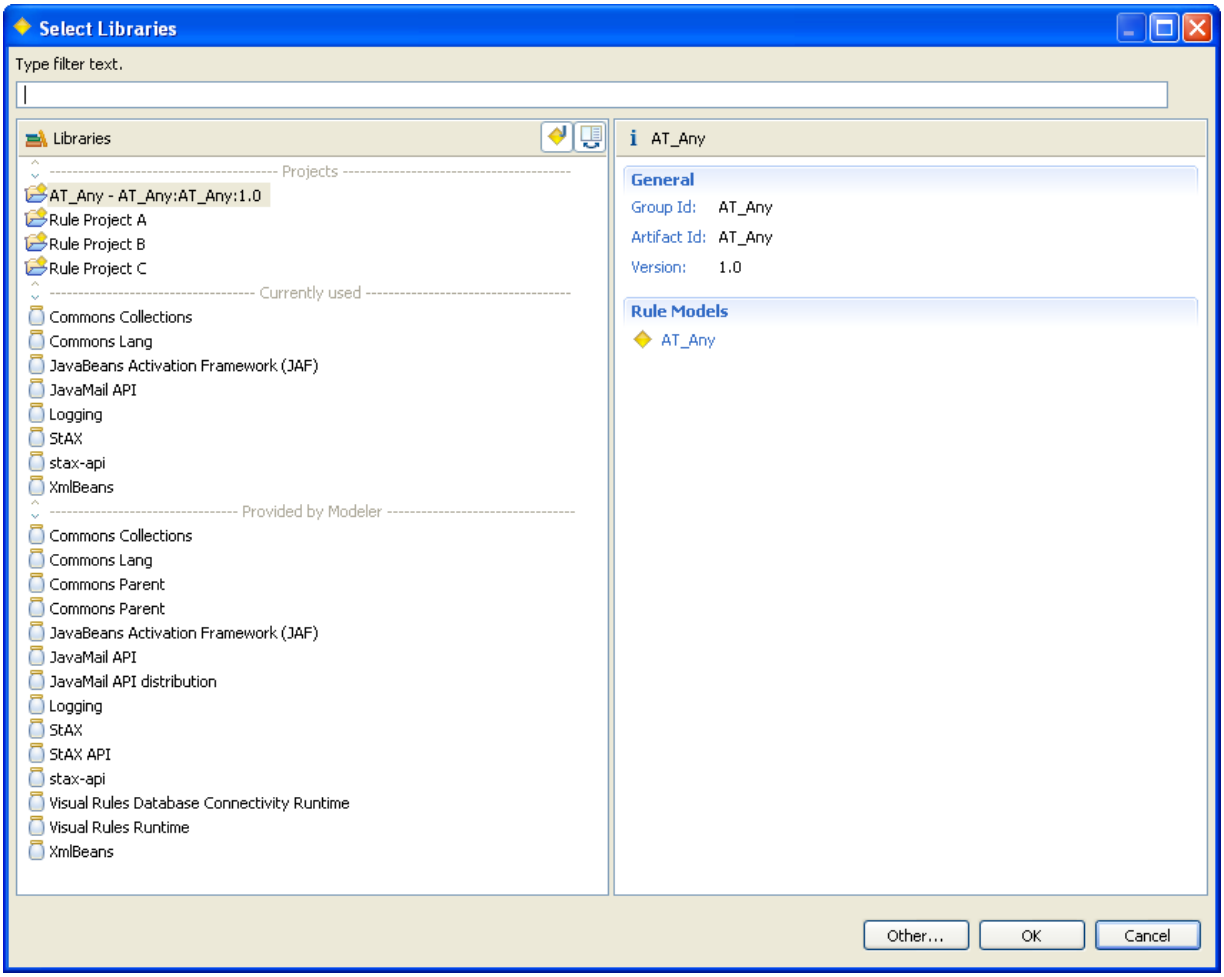


Figure 5.27. Select Dependency Dialog

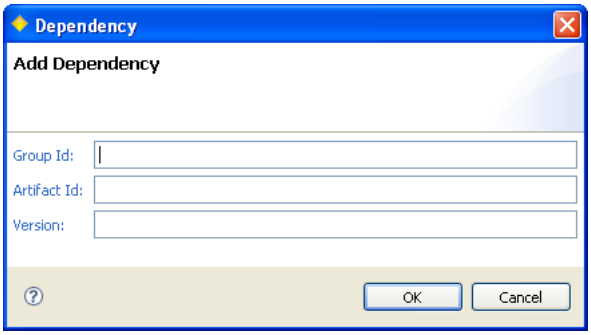


Figure 5.28. Dialog to define a new Dependency

Select Dependency Dialog element	Beschreibung
Other...	Opens the dialog **Dependency** to define and a add new, currently unknown library as dependency.

Related References. Section 5.3.6, “Rule Project Editor” [214]

5.5. Views

The user interface of Visual Rules consists of several views that are arranged next to each other. The following sections describe the different views available in Visual Rules.

5.5.1. Rule Explorer View

The **Rule Explorer** lists all the projects in the workspace and their rule models. It hides away technical elements, especially any Java specific elements. That is why the **Rule Explorer** is used in the non-technical **Rule Modeling** perspective.

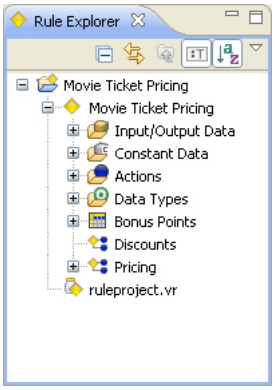


Figure 5.29. Rule Explorer view

Icon	Description
	Collapses all expanded elements in the resource tree.
	Determines if the view selection is linked to the active editor. When this option is selected, changing the active editor will automatically update the Rule Explorer selection to the resource being edited.
	Determines if data types of rule model elements are displayed or not.
	This is used to toggle if data elements are displayed in alphabetically or manual order.

Related Concepts.

- Section 3.1, “Rule Project” [25]
- Section 3.2, “Rule Model” [25]

Related Tasks.

- Section 4.2, “Working with Rule Models” [93]
- Section 4.6.11, “Sorting Data Elements Manually” [147]

Related References.

- Section 5.1.1, “Rule Modeling Perspective” [197]
- Section 5.5.2, “Project Explorer View” [223]
- Section 5.5.6, “Properties View” [226]

5.5.2. Project Explorer View

The **Project Explorer** is the general purpose view for working with projects. It lists all the projects and their contents (files, models etc.), including different technical elements.

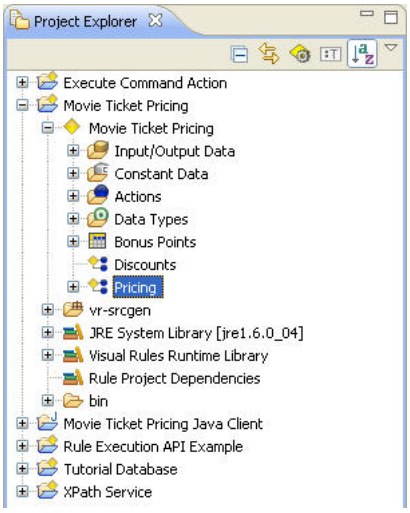


Figure 5.30. Project Explorer view

The **Project Explorer** view is not specific to Visual Rules but part of the Eclipse platform underlying Visual Rules. You can find more information in the Workbench User Guide (part of the documentation for the Eclipse platform).

Icon	Description
	Collapses all expanded elements in the resource tree.
	Determines if the view selection is linked to the active editor. When this option is selected, changing the active editor will automatically update the Rule Explorer selection to the resource being edited.
	Triggers rule code generation for the selected rule model.
	Determines if data types of rule model elements are displayed or not.
	This is used to toggle if data elements are displayed in alphabetically or manual order.

Related Concepts.

- Section 3.1, “Rule Project” [25]
- Section 3.2, “Rule Model” [25]

Related Tasks.

- Section 4.2, “Working with Rule Models” [93]
- Section 4.6.11, “Sorting Data Elements Manually” [147]

Related References.

- Section 5.1.2, “Rule Integration Perspective” [198]
- Section 5.5.1, “Rule Explorer View” [223]
- Section 5.5.6, “Properties View” [226]

5.5.3. Problems View

The **Problems** view displays a list of all current errors and warnings that Visual Rules has detected. Double-click on an entry to navigate to the problem location.

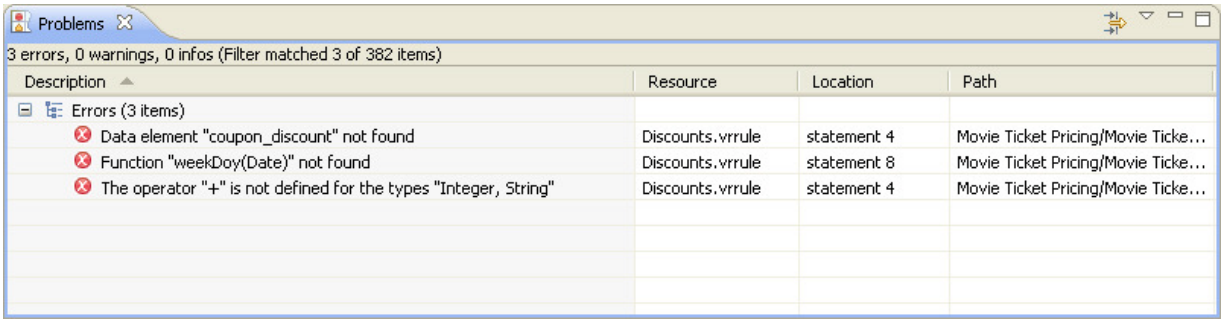


Figure 5.31. Problems view

The **Problems** view is not specific to Visual Rules but part of the Eclipse platform underlying Visual-Rules. You can find more information in the Workbench User Guide (part of the documentation for the Eclipse platform).

5.5.4. Outline View

The **Outline** view displays a compact representation of the rule being edited. A blue box is drawn around the currently visible part of the rule. You can use the mouse to move this box around. The rule editor will scroll its viewport accordingly.

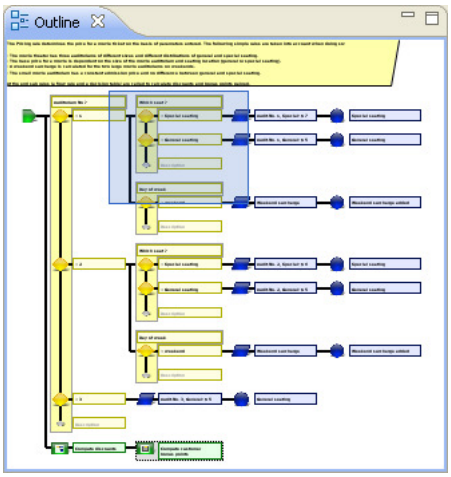


Figure 5.32. Outline view

Related Concepts.

- Section 3.6, “Flow Rule Editor” [45]

Related Tasks.

- Section 4.3.3, “Navigating in the Flow Rule Editor” [104]

5.5.5. Search View

The **Search** view displays search results and is automatically opened whenever the user performs a search. Double-click on an entry to navigate to the location where the search found that match.

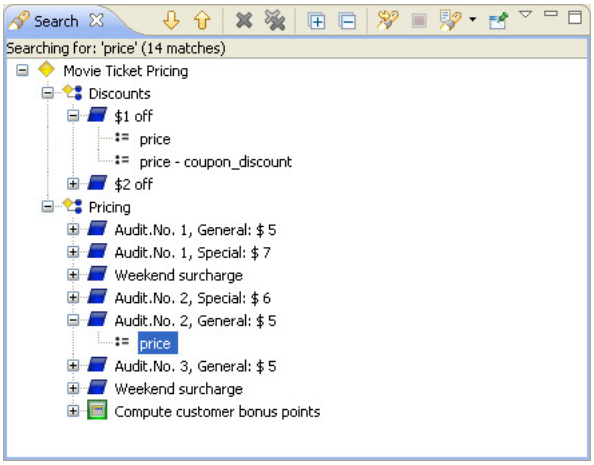


Figure 5.33. Search view

The **Search** view is not specific to Visual Rules but part of the Eclipse platform underlying Visual-Rules. You can find more information in the Workbench User Guide (part of the documentation for the Eclipse platform).

Related Tasks.

- Section 4.14, “Searching Rule Models” [178]

5.5.6. Properties View

The **Properties** view shows informations and settings for the currently selected element. Whenever you select an item in the **Rule Explorer** or in the rule editor, the **Properties** view will be updated and show the properties of that element.

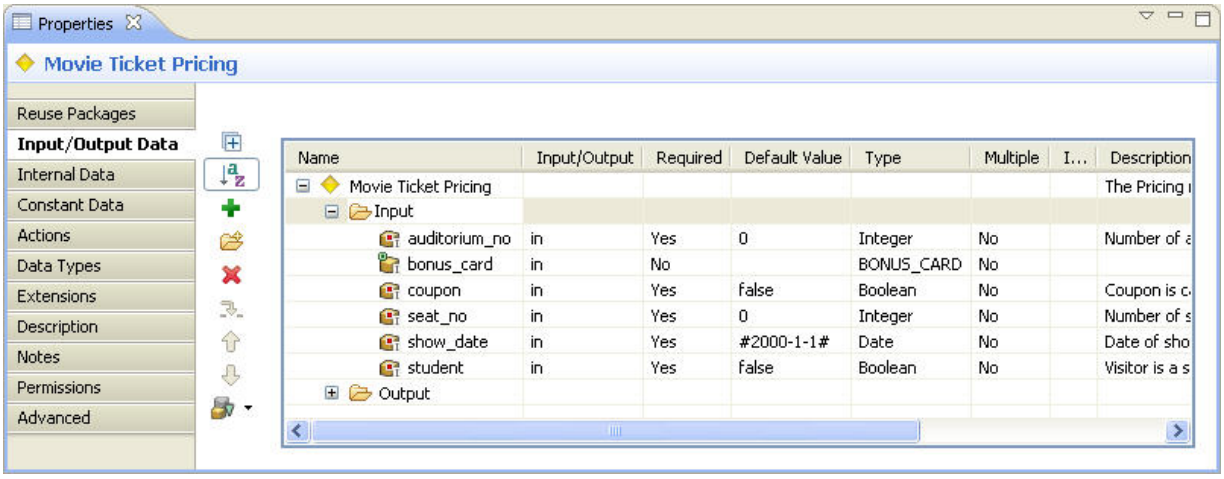


Figure 5.34. Properties view

Properties are usually displayed on several tabs. You can bring a tab to the front by clicking on the tab name displayed to the left. Detailed descriptions of the different tabs for specific rule model elements can be found in the following sections.

The **Properties** view is not specific to Visual Rules but part of the Eclipse platform underlying Visual Rules. You can find more information in the Workbench User Guide (part of the documentation for the Eclipse platform).

5.5.7. Statistics View

The **Statistics** view shows information on the execution of the test suite or test covered by the statistic currently active. Here the focus can be restricted to an individual test case with the navigation in the header.

The navigation also controls the focus in the flow rule editor or in the decision table editor, respectively.

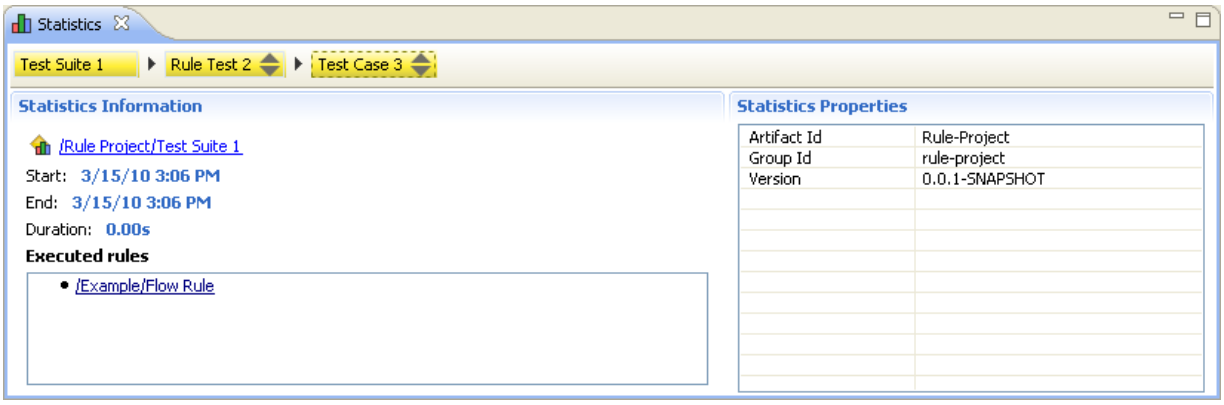


Figure 5.35. Statistics view

.

Icon	Description
or	Hyperlink to the relevant statistics file or result file
Start:	Start time of the execution
End:	End time of the execution
Duration:	Time duration of the execution
Executed rules	Hyperlinks to the rules that have been part of the execution
Statistic Properties	Any additional information, e.g. identifiers of the relevant project

5.5.8. Debug View

The **Debug** view is used during debug sessions. When execution is halted, it shows the current execution trace which lists the rules and rule elements that are currently being executed. The current position of execution is represented by the top most element.

The view toolbar contains buttons to control the debugger.

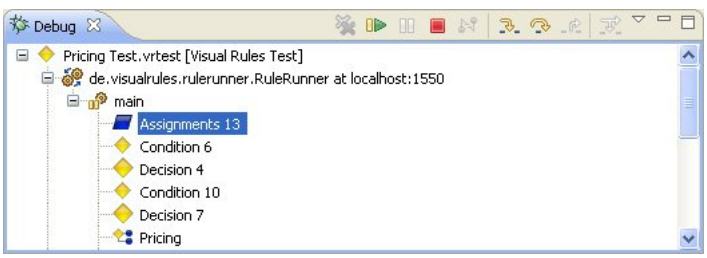


Figure 5.36. Debug view

Icon	Shortcut	Description
	F8	Resumes rule execution when it was halted. Rule execution will continue until it either hits another breakpoint or finishes.
		Terminates rule execution.
		Disconnects the debugger. This button is only available during a remote debug session when it is connected to a remote Java VM.
	F5	Steps to the next rule element. This also enters Flow Rule Calls and Decision Table Calls.
	F6	Steps over the remainder of the branch and then halts. Flow Rule Calls and Decision Table Calls are not entered.

Related Tasks.

- Section 4.13, “Debugging Rules” [175]

Related References.

- Section 5.1.3, “Debug Perspective” [199]

5.5.9. Variables View

The **Variables** view is used during debug sessions. When execution halts at a breakpoint, it shows the current data elements and their values.

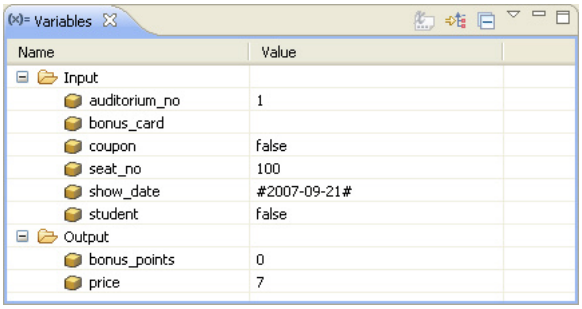


Figure 5.37. Variables view

There are several options that affect the contents and display of the **Variables** view. These options are available from the menu ( ) in the view toolbar.

Option	Description
Show Input/Output Data	When selected, input and output data elements are included in the view.
Show Internal Data	When selected, internal data elements are included in the view.
Show Actions	When selected, actions are included in the view.
Show Constant Data	When selected, constant data elements are included in the view.
Show Groups	When selected, groups are included in the view.

Related Tasks.

- Section 4.13.3, “Stepping Through Rules” [176]

Related References.

- Section 5.1.3, “Debug Perspective” [199]

5.5.10. Breakpoints View

The **Breakpoints** view shows all currently existing breakpoints in all projects and rule models. Breakpoints can be temporarily disabled by unchecking the check box in front of it. Breakpoints can also be deleted here.

The **Breakpoints** view is not specific to Visual Rules but part of the underlying Eclipse platform. So it may not only show breakpoints in rules but also breakpoints of other tools (e.g. breakpoints in Java code or else).

The view is normally shown as part of the **Debug** perspective.

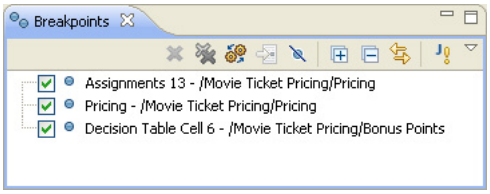

Breakpoints
Assignments 13 - /Movie Ticket Pricing/Pricing
Pricing - /Movie Ticket Pricing/Pricing
Decision Table Cell 6 - /Movie Ticket Pricing/Bonus Points

Figure 5.38. Breakpoints view

Icon	Description
	Removes the selected breakpoints
	Removes all breakpoints
	When pressed, only supported breakpoints are shown during a debug session
	When pressed, all breakpoints are skipped as if they were disabled

Related Tasks.

- Section 4.13.1, “Setting Breakpoints” [175]

Related References.

- Section 5.1.3, “Debug Perspective” [199]

5.6. Properties Tabs

The following sections describe the tabs available in the **Properties** view. Most tabs are only available when specific rule model elements are selected, e.g. a **Fire Action** tab is only visible when you select a **Fire Action** element in the rule editor.

5.6.1. General

The following properties tabs are available for all elements of a rule model.

5.6.1.1. Description Tab

This tab is used to view and edit the description of the selected element. Descriptions can contain hyperlinks to reference external content.

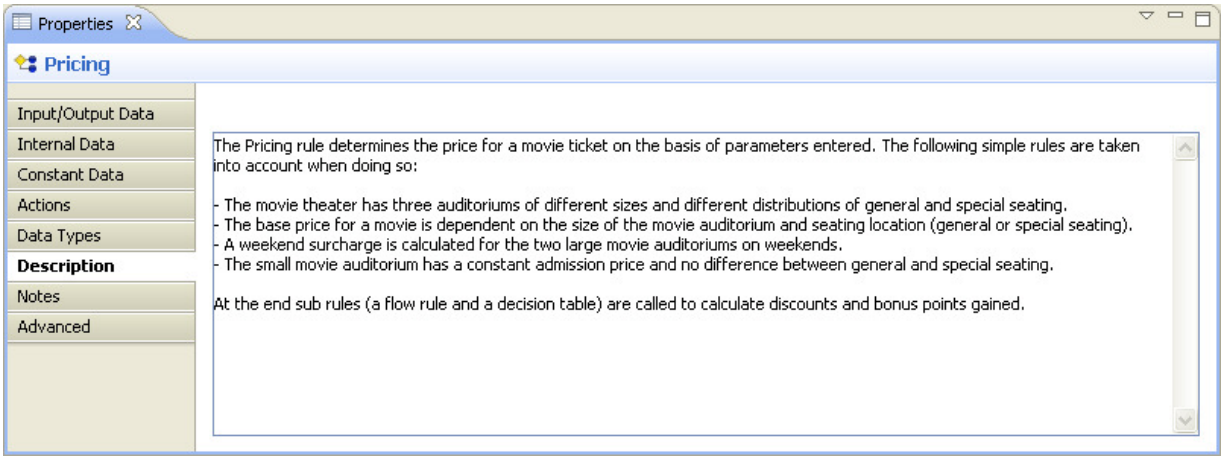

Properties
Pricing
Input/Output Data
Internal Data
Constant Data
Actions
Data Types
Description
Notes
Advanced
The Pricing rule determines the price for a movie ticket on the basis of parameters entered. The following simple rules are taken into account when doing so:
- The movie theater has three auditoriums of different sizes and different distributions of general and special seating.
- The base price for a movie is dependent on the size of the movie auditorium and seating location (general or special seating).
- A weekend surcharge is calculated for the two large movie auditoriums on weekends.
- The small movie auditorium has a constant admission price and no difference between general and special seating.
At the end sub rules (a flow rule and a decision table) are called to calculate discounts and bonus points gained.

Figure 5.39. Description tab

5.6.1.2. Notes Tab

This tab is used to view and edit the notes attached to the currently selected element. Notes can contain hyperlinks to reference external content. Every note is listed along with the information who created it and when.

Figure 5.40. Notes tab

Icon	Description
	Adds another note.
	Removes the corresponding note.

5.6.2. Rule Elements

The following properties tabs are available when rule elements in the rule editor are selected.

5.6.2.1. Decision Overview Tab

This tab is shown when a decision is selected in the rule editor. It shows the descriptions and expressions for the decision and for all its conditions.

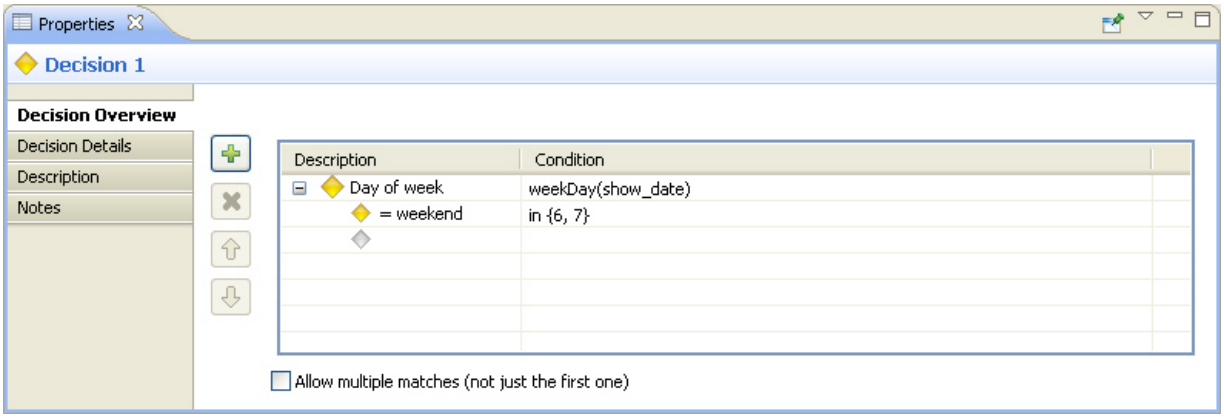


Figure 5.41. Decision Overview tab

Icon	Description
	Adds another condition.
	Removes the currently selected condition including all rule elements that may be attached to it.

Table Column	Description
Description	This column shows the description of the decision. You can edit cells in this column by double-clicking them.
Condition	This column shows the condition under which this condition branch is executed. The first row shows the condition prefix. You can edit cells in this column by double-clicking them.

Option	Description
Allow multiple matches (not just the first one)	When unchecked, only the branch of the first condition which evaluates to true is executed. When checked, the decision will evaluate all conditions and execute the branches of all conditions which evaluate to true.

Related References.

- Section 5.6.2.2, “Decision Details Tab” [231]

5.6.2.2. Decision Details Tab

This tab is shown when a decision is selected in the rule editor. It shows a list of all the different conditions, with the condition prefix in the first line. To the right it shows the description and the expression of the currently selected condition. This tab gives the user more room for editing the descriptions and expressions, but does not show everything at the same time like the **Decision Overview** tab.

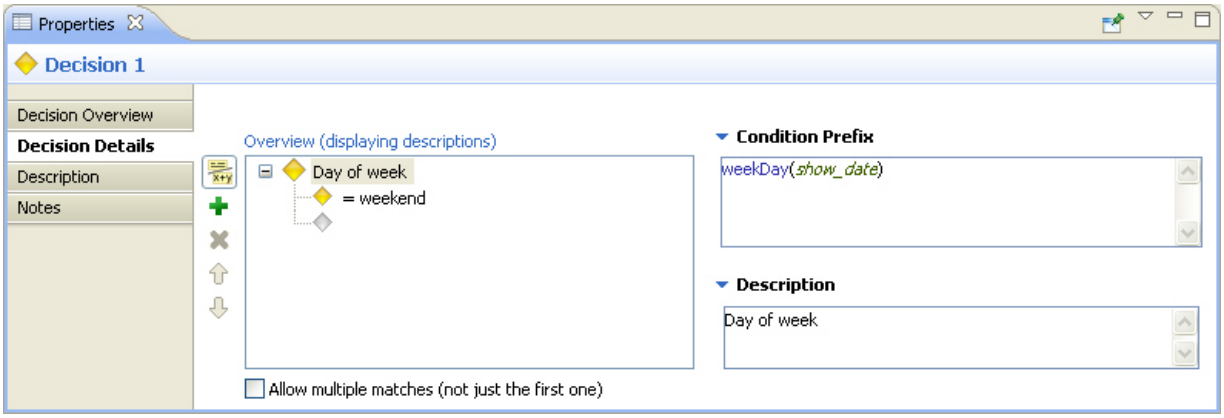


Figure 5.42. Decision Details tab

Icon	Description
	Toggles between display of the descriptions and conditions.
	Adds another condition.
	Removes the currently selected condition including all rule elements that may be attached to it.

Option	Description
Condition Prefix	This input field is displayed when the first row in the list (the decision) is selected. Enter the optional prefix for all the conditions here.
Condition	This input field is displayed when a condition in the list is selected. Enter the expression for the condition here.
Description	Enter the description for the currently selected item (decision, conditions or else exit) here.
Allow multiple matches (not just the first one)	When unchecked, only the branch of the first condition which evaluates to true is executed. When checked, the decision will evaluate all conditions and execute the branches of all conditions which evaluate to true.

Related References.

- Section 5.6.2.1, “Decision Overview Tab” [230]

5.6.2.3. Assignments Tab

This tab is shown when an assignment element is selected in the rule editor. It shows a list of all the different assignments within this assignment element.

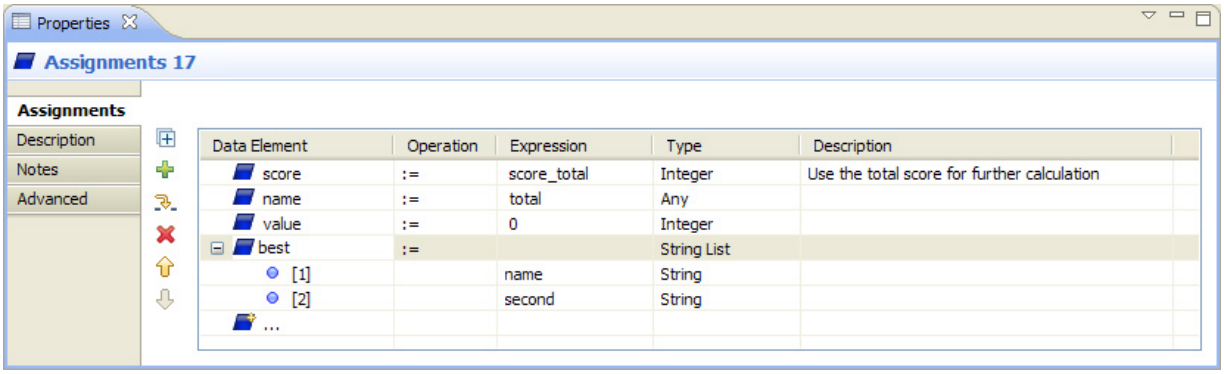


Figure 5.43. Assignments tab

Icon	Description
	Initially all right sides of the elements are collapsed. This button will expand them so that all entered values are visible. This only has an effect if at least one element is available.
	Adds another assignment.
	Inserts another element to a collection, list or set. This is only available when the data element of the currently selected assignment is a collection, list or set.
	Removes the currently selected assignment.
	Moves the currently selected assignment up one position within the list.
	Moves the currently selected assignment down one position within the list.

Table Column	Description
Data Element	This column shows the data element whose value is changed in the assignment. You can edit cells in this column by double-clicking them.
Operation	This column shows the operation the assignment will perform. When you double-click a cell in this column you can choose the type of assignment. The possible choices are := Normal assignment (default). The data element will be assigned the result of the expression. ADD Collection addition. The result of the expression will be added to the collection specified as the data element. For example: `{2,3} ADD 4` will produce `{2,3,4}`. The data element must be a collection type. If the expression is also a collection type, the two collections will be merged. For example: `{2,3} ADD {4,5}` produces `{2,3,4,5}` REMOVE Collection removal. The result of the expression will be removed from the collection on the left side. For example: `{2,3} REMOVE 3` produces `{2}`. The data element must be a collection type. If the expression is also a collection type all elements from the right collection are removed from the left collection. For example: `{2,3,4} REMOVE {2,3}` produces `{4}` CLEAR Collection clearing. This removes all elements from the collection specified as the data element. This operation does not have an expression on the right side.
Expression	This column shows the expression used to calculate the value which is then assigned to the data element. You can edit cells in this column by double-clicking them.

Table Column	Description
Type	This column shows the type of the data element to assign to. Cells in this column are read-only.
Description	This column shows the description of the assignment. You can edit cells in this column by double-clicking them.

5.6.2.4. Fire Action Tab

This tab is shown when a Fire Action element is selected in the rule editor. Here you specify what action should be fired and optionally configure any input parameters the action may require.

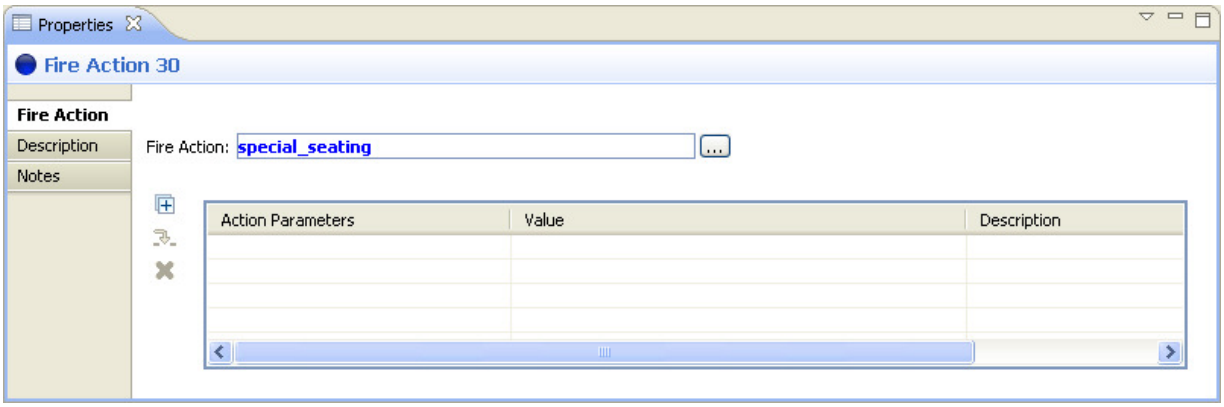


Figure 5.44. Fire Action tab

Option	Description
Fire Action	Enter the name of the action that should be fired here. Code Assist (**Ctrl**+**Space**) is available.

5.6.2.5. Call Flow Rule

This tab is shown when a Call Flow Rule element is selected in the rule editor. Here you specify the rule to be called and any necessary input data. Additionally, you specify which data elements the output of the rule should be assigned to.

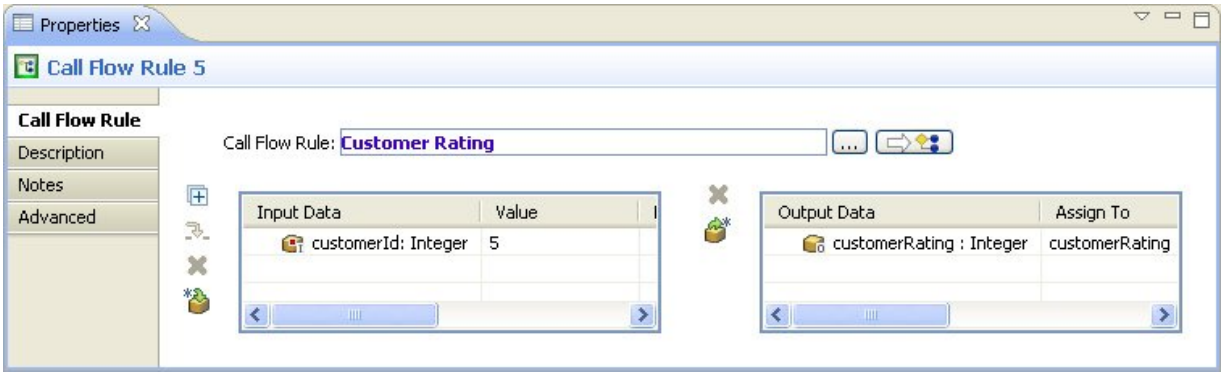


Figure 5.45. Call Flow Rule tab

Option	Description
Call Flow Rule	Enter the name of the flow rule that you want to call here. Press **Ctrl**+**Space** for content assist or click on **...** to select the rule from a list of available rules.

Icon	Description
	Opens the flow rule being called in the rule editor.
	Initially all elements are collapsed. This button will expand them so that all elements are visible. This only has an effect if at least one ielement is available.
	Inserts another element to a collection, list or set. This is only available when the selected input data element is a collection, list or set.
	Removes the currently selected value for a collection data element. If the input data element of the rule you are reusing does not exist anymore you can remove the value you previously assigned to it with this button.
	This button automatically inserts data elements as input data, when they have the same name and type. Only inputs still without a value will be affected.
	This button automatically inserts data elements to assign the outputs to, when they have the same name and type. Only outputs not yet assigned will be affected.

Table Column	Description
Input Data	This column shows the name and type of the input data of the rule you are calling. Cells in this column are read only.
Value	The value you want to assign to the input data. This can be any expression. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

Table Column	Description
Output Data	This column shows the name and type of the output data of the rule you are calling. Cells in this column are read only.
Assign To	The data element you want to assign the value of this output element to. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

5.6.2.6. Call Decision Table

This tab is shown when a Call Decision Table element is selected in the rule editor. Here you specify the decision table to be called and any necessary input data. Additionally, you specify which data elements the output of the decision table should be assigned to.

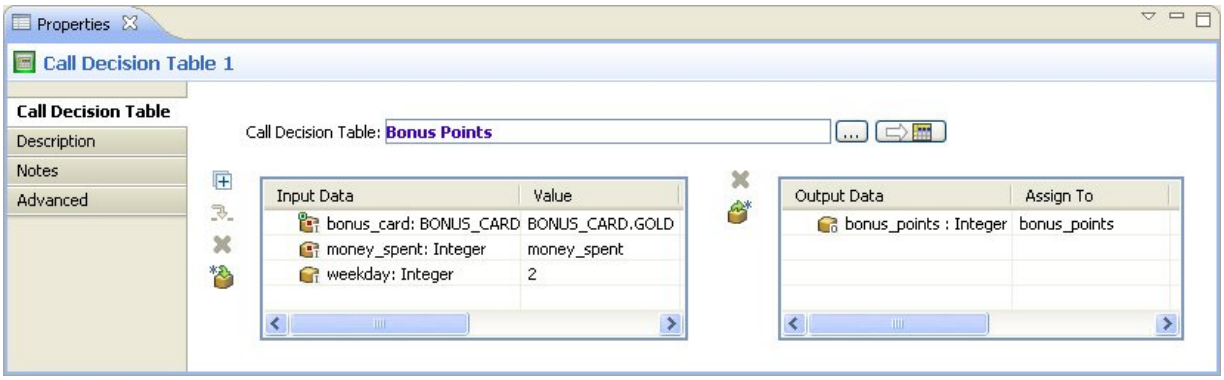


Figure 5.46. Call Decision Table tab

Option	Description
Call Decision Table	Enter the name of the decision table that you want to call here. Code Assist (**Ctrl**+**Space**) is available.

Icon	Description
	Opens the editor for the decision table being called.
	Initially all elements are collapsed. This button will expand them so that all elements are visible. This only has an effect if at least one element is available.
	Inserts another element to a collection, list or set. This is only available when the selected input data element is a collection, list or set.
	Removes the currently selected value for a collection data element. If the input data element of the decision table you are calling does not exist anymore, this button removes the value you previously assigned to it.
	This button automatically inserts data elements as input data, when they have the same name and type. Only inputs still without a value will be affected.
	This button automatically inserts data elements to assign the outputs to, when they have the same name and type. Only outputs not yet assigned will be affected.

Table Column	Description
Input Data	This column shows the name and type of the input data of the decision table you are calling. Cells in this column are read only.
Value	The expression you want to assign to the input data. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

Table Column	Description
Output Data	This column shows the name and type of the output data of the decision table you are calling. Cells in this column are read only.
Assign To	The data element you want to assign the value of this output element to. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

5.6.2.7. Call Service

This tab is shown when a Call Service element is selected in the rule editor. Here you specify the service you want to call including any necessary input data. Additionally, you specify what to do with the output data returned by the service.

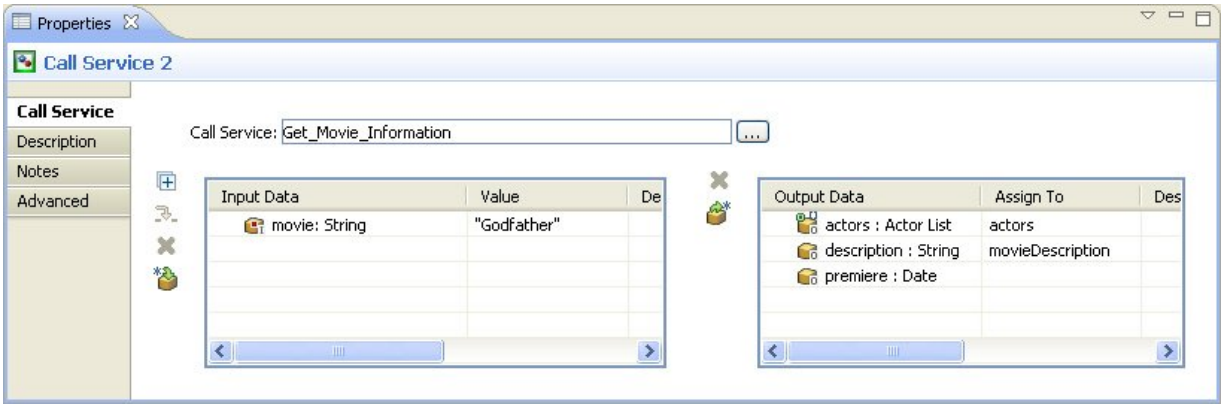


Figure 5.47. Call Service tab

Option	Description
Call Service	Enter the name of the service that you want to call. Code Assist (**Ctrl**+**Space**) is available.

Icon	Description
	Initially all elements are collapsed. This button will expand them so that all elements are visible. This only has an effect if at least one element is available.
	Inserts another element to a collection, list or set. This is only available when the selected input data element is a collection, list or set.
	Removes the currently selected value for an input data element.
	This button automatically inserts data elements as input data, when they have the same name and type. Only inputs still without a value will be affected.
	This button automatically inserts data elements to assign the outputs to, when they have the same name and type. Only outputs not yet assigned will be affected.

Table Column	Description
Input Data	This column shows the name and type of the intput data elements of the service you are calling. Cells in this column are read only.
Value	The data element you want to assign the value of the intput element to. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

Table Column	Description
Output Data	This column shows the name and type of the output data element of the service you are calling. Cells in this column are read only.
Assign To	The data element you want to assign the value of the output element to. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

5.6.2.8. Repeat Tab

This tab is shown when a Repeat element is selected. It allows you to define how often or under what conditions the successors will be repeated.

Option	Description
for each of multiple elements	Select this if you want to repeat execution for each one of multple data elements in a collection.
while a condition holds	Select this if you want to repeat execution as long as a specific condition is true.
with counter	Select this if you want to repeat execution a specific number of times.

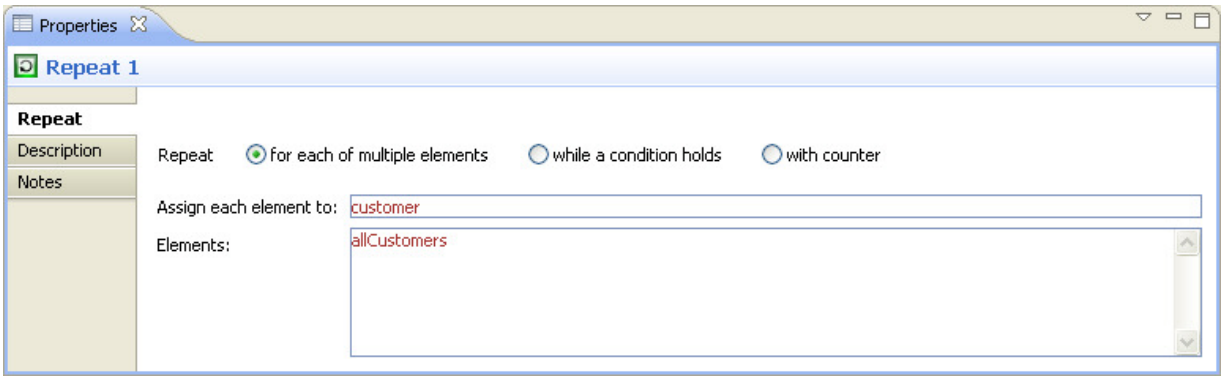


Figure 5.48. Repeat tab - for each

Option	Description
Assign each element to	Enter an expression that specifies a data element that each element of the collection is assigned to. Code Assist (**Ctrl**+**Space**) is available.
Elements	Enter an expression that specifies the collection of elements whose elements will be assigned to the data element specified above. Every time the Repeat executes, the next data element is assigned to the data element specified in the **Assign each element to** field. If the number of data elements is zero, the Repeat is not executed at all. Code Assist (**Ctrl**+**Space**) is available.

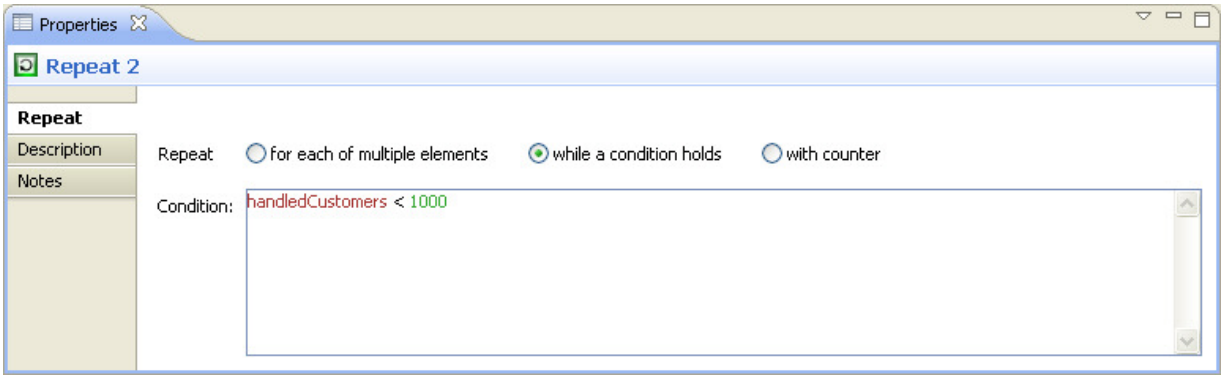


Figure 5.49. Repeat tab - condition

Option	Description
Condition	Enter an expression for the condition. Execution repeats as long as the specified condition is true and ends when the condition is false. If the condition is false right from the beginning, the Repeat is not executed at all. Code Assist (**Ctrl**+**Space**) is available.

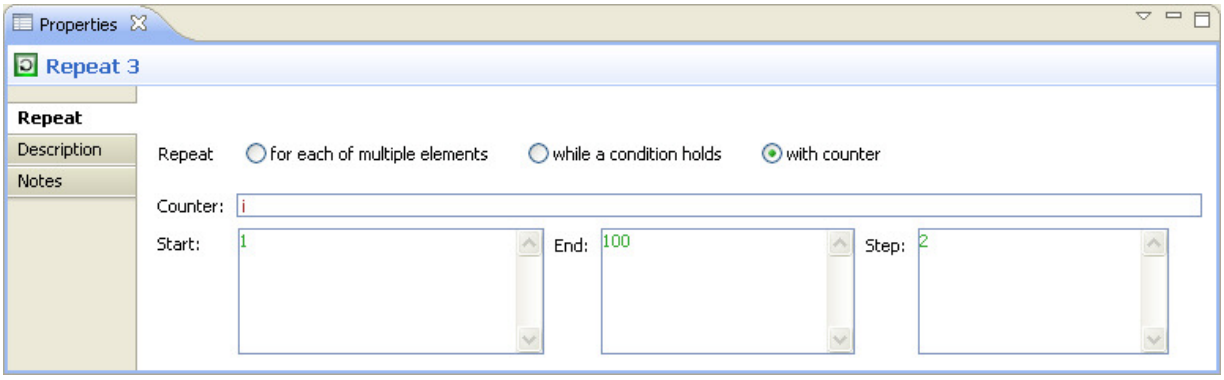


Figure 5.50. Repeat tab - counter

Option	Description
Counter	Enter an expression that specifies a data element for the counter. The current value of the counter will be stored in the data element specified here. The counter starts with a given start value (**Start**) and is incremented each time by a given step value (**Step**) until it reaches (or passes) the given end value (**End**). The counter is optional. Code Assist (**Ctrl**+**Space**) is available.
Start	Enter the start value for the counter. This can be any expression that evaluates to a number. Code Assist (**Ctrl**+**Space**) is available.
End	Enter the end value for the counter. This can be any expression that evaluates to a number. Code Assist (**Ctrl**+**Space**) is available.
Step	Enter the step value for the counter. This can be any expression that evaluates to a number. Code Assist (**Ctrl**+**Space**) is available.

5.6.2.9. Return Exception Tab

This tab is shown when a return exception node is selected in the rule editor. You can specify the exception that should be returned here. You can either choose to return an previously created exception or create a new exception to return.

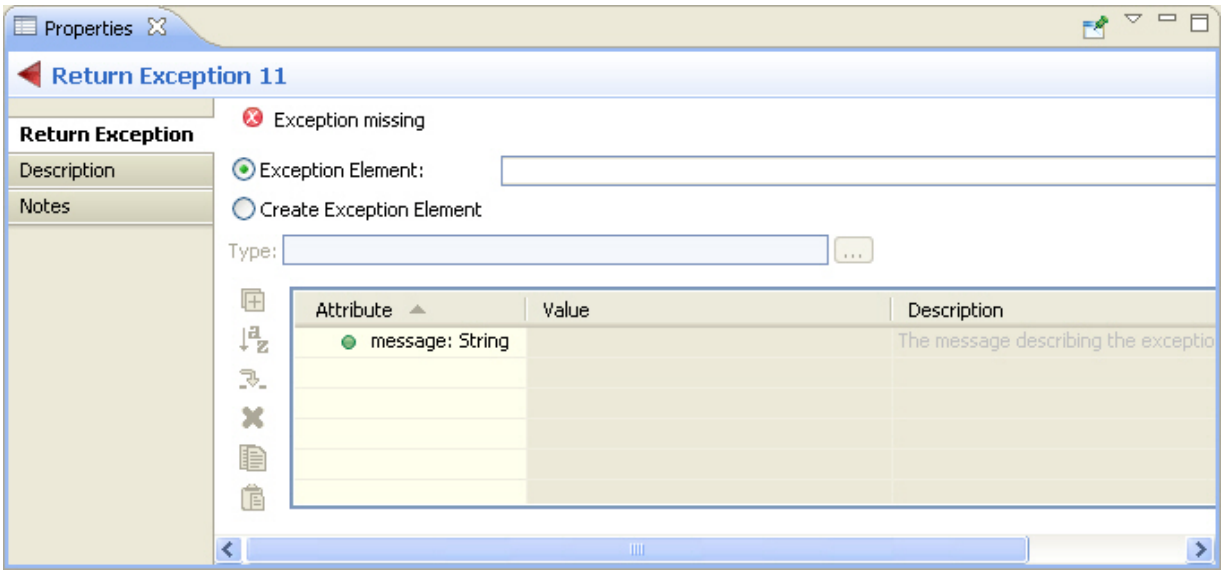


Figure 5.51. Return Exception tab

Option	Description
Exception Element	Activate this and enter an expression which results in the exception element you want to return. Code Assist (**Ctrl**+**Space**) is available.
Create Exception Element	Activate this if you want to create a new exception element. Code Assist (**Ctrl**+**Space**) is available.
Type	Enter the type of exception element you want to create.

Table Column	Description
Name	This column shows the name and type of the exception attributes. Cells in this column are read only.
Value	The value you want to assign to this attribute. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

Icon	Description
	This button will expand all elements so that all elemtents are visible.
	Removes the currently selected value.
	Inserts another element to a collection, list or set. This is only available when the selected attribute is a collection, list or set.

5.6.2.10. Handle Exception Tab

This tab is shown when a handle exception node is selected in the rule editor. You can specify a data element that shall hold the exception for further processing.

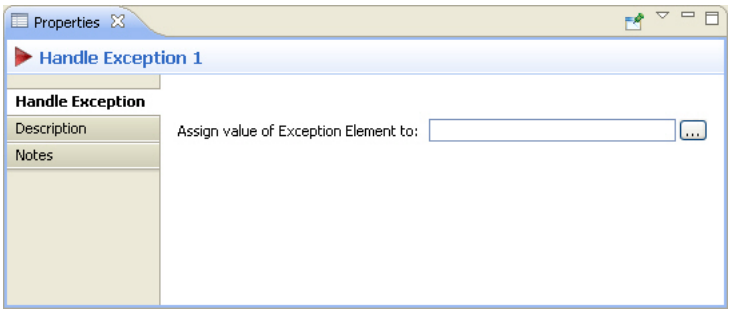


Figure 5.52. Handle Exception tab

Option	Description
Assign value of Exception Element to	Enter an expression that specifies a data element to which the value of the exception element is assigned. Only exceptions of the data element's type are handled.

5.6.3. State Flow Elements

The following properties tabs are available when state flow elements in the state flow editor are selected.

5.6.3.1. State Tab

This tab is shown when a state flow element is selected in the state flow editor. It shows the name of the element and whether or not it is an end state element.

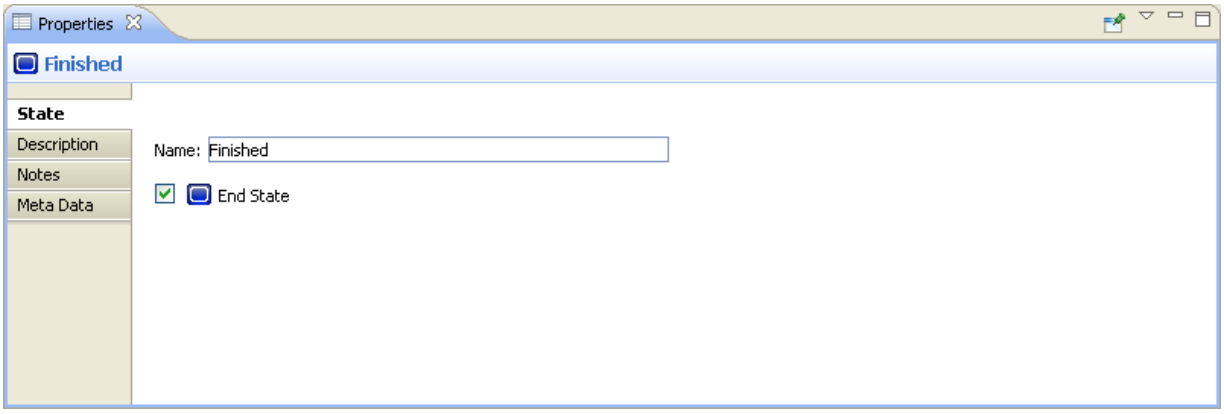


Figure 5.53. State tab

5.6.4. Rule Models

The following properties tabs are available for rule models.

5.6.4.1. Extensions tab

This tab allows to activate specific extensions for the rule models. Extensions provide specific functions, action types or service types that can be used anywhere in the rule model once the extension is activated.

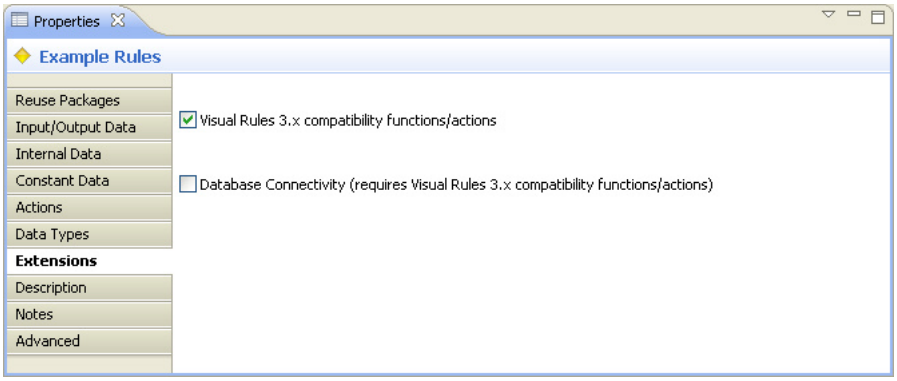


Figure 5.54. Extensions tab

Option	Description
Visual Rules 3.x compatibility functions/actions	When activated, gives access to some functions and action types that were available in Visual Rules 3.x. In particular, this includes the string list functions and the "Read CSV file" action type.
DatabaseIntegrator	When activated, gives access to the action types for direct database access. See the **DatabaseIntegrator** manual for more information. The DatabaseIntegrator is an optional add-on for Visual Rules.

5.6.5. Rule Packages

The following properties tabs are available for rule packages (including rule models).

5.6.5.1. Reuse Packages Tab

This tab shows all the rule packages referenced for reuse.

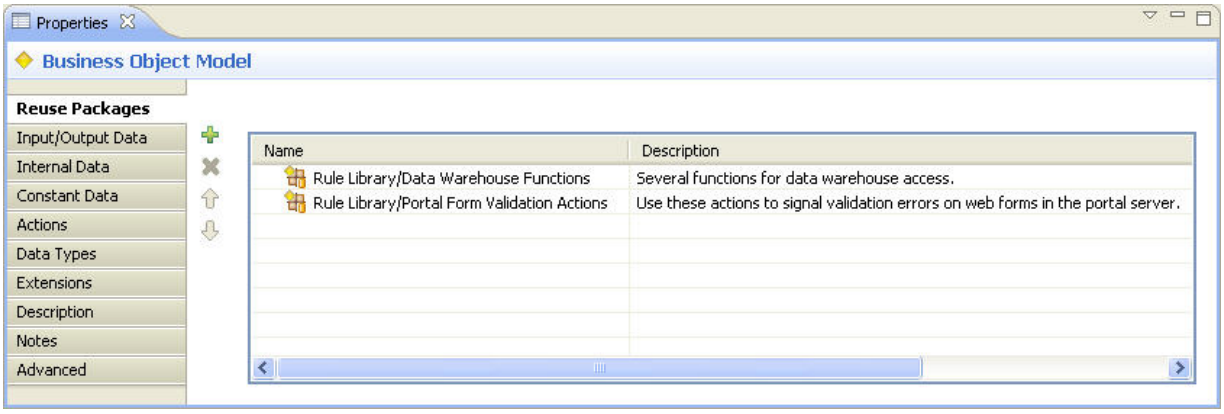


Figure 5.55. Reuse Packages tab

Icon	Description
	Allows you to select which rule packages you want to reuse.
	Removes the currently selected reused package from the list.
	Moves the currently selected reused package up one position within the list.
	Moves the currently selected reused package down one position within the list.

Table Column	Description
Name	This column shows the name and the rule model of the rule packages you are reusing. Cells in this column are read only.
Description	The description for this row. You can edit cells in this column by double-clicking them.
Project	The Project this package is in. Cells in this column are read only.

Related Concepts.

- Section 3.3.1, “Rule Package Reuse” [28]

Related Tasks.

- Section 4.2.19, “Reusing Rule Packages” [101]

Related References.

- Section 5.4.4, “Select Dialog” [218]

5.6.6. Data

The following properties tabs are available where data elements can be defined, i.e. rule models, rule packages or rules.

5.6.6.1. Data Element

This tab is activated, when one or multiple data elements are selected.

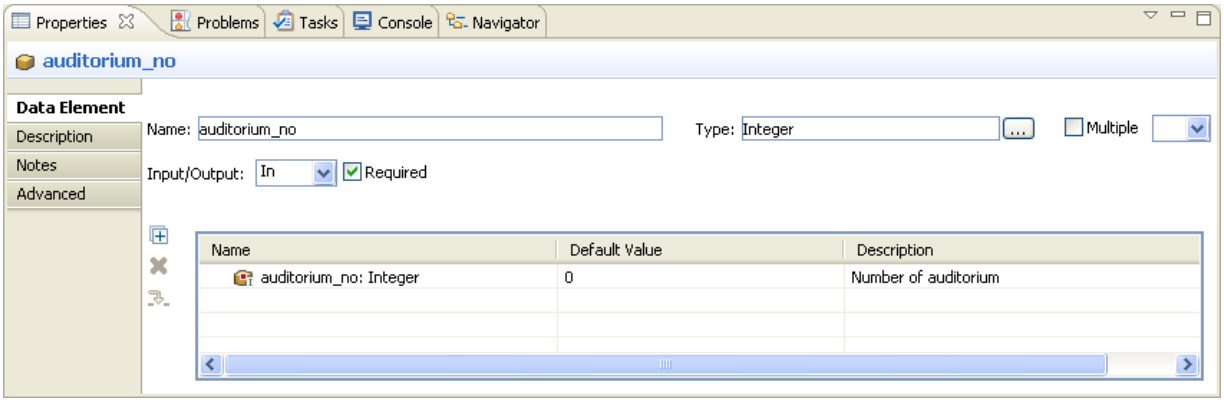


Figure 5.56. Data Element tab for Input/Output data

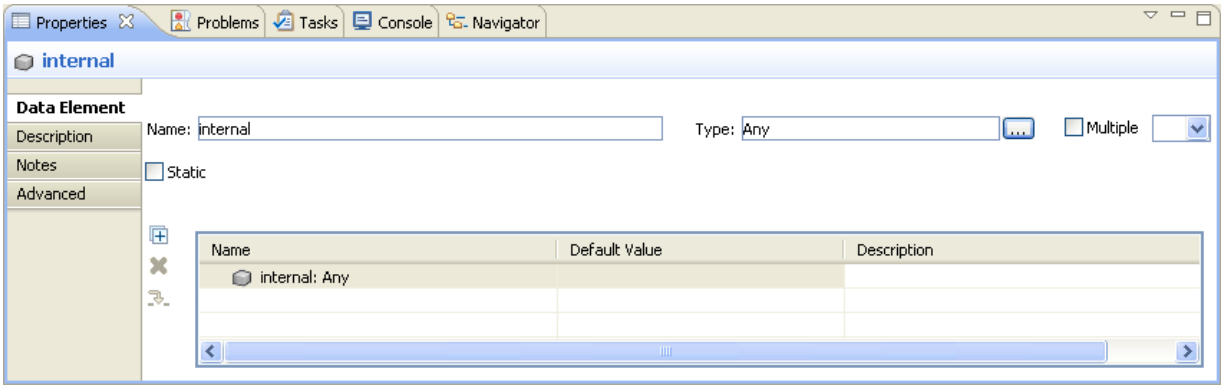


Figure 5.57. Data Element tab for Internal data

Option	Description
Name	The name of the selected element. This only appears when one element is selected.
Type	This allows changing the type of all selected elements. The name of the type is displayed, if all selected elements are of the same type, otherwise the field is empty.
Multiple	Controls if all selected data elements hold a single or multiple values. This is only available for Attributes, Input/Output, Internal and Constant Data.
Input/Output	Shows wether the selected elements are used for input, for output or for both. This is only available for Input/Output Data.
Required	Controls if all selected data elements are required. This is only available for Input/Output Data.
Static	Controls if all selected data elements are static. This is only available for Internal Data.

When selecting multiple data elements of different kinds, the tab will only show settings, which the elements have in common.

The following settings are only available when a single element is selected.

Icon	Description
	Initially all elements are collapsed. This button will expand them so that all elements are visible. This only has an effect if there is at least one element available.
	Removes the currently selected element or group.

Icon	Description
	Inserts another element to a collection, list or set. This is only available when the selected attribute is a collection, list or set.

Table Column	Description
Name	This column shows the name of the element. You can edit cells in this column by double-clicking them.
Default Value	The default value which will be used when you access the data element when no other value has been set. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

5.6.6.2. Input/Output Data Tab

This tab shows a list of all the input/output data elements defined on the selected rule model, rule package or rule.

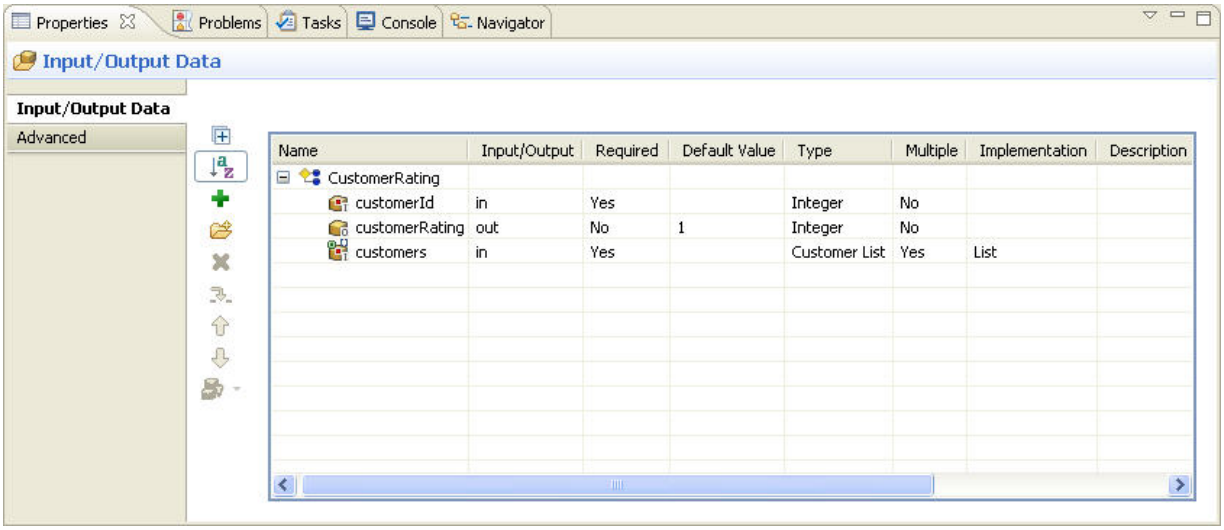


Figure 5.58. Input/Output Data tab

Icon	Description
	Initially all elements are collapsed. This button will expand them so that all elements are visible. This only has an effect if there is at least one element available.
	This button is used to toggle the alphabetically sorting of the elements.
	Adds a new Input/Output Data element.
	Creates a new group. This allows you to organize your data.
	Removes the currently selected element or group.
	Inserts another element to a collection, list or set. This is only available when the selected attribute is a collection, list or set.
	Allows manually changing the order of the elements. This is only applicable, if alphabetically sorting ( ) is turned off.

Icon	Description
	Converts the selected element to either **Constant Data** or **Internal Data**.

Table Column	Description
Name	This column shows the name of the input/output data element. The first row shows the name of the element they are attached to. You can edit cells in this column except for the one in the first row by double-clicking them.
Input/Output	This column shows wether the data element is used for input, for output or for both. You can edit cells in this column by double-clicking them.
Required	This column shows wether the data element is required. You can edit cells in this column by double-clicking them. Only input and input/output parameters can be required.
Default Value	The default value which will be used when you access the data element when no other value has been set. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Type	The type of the data element. You can edit cells in this column by double-clicking them.
Multiple	This column shows wether the data element holds a single or multiple values of this type. You can edit cells in this column by double-clicking them.
Implementation	In this column you can specify the collection implementation to be used for a data element that will have multiple entries. You can edit a cell by double-clicking on it. The behavior of the collection depends on the implementation type you select, which can be either of the following three types available: List, Set, or Map (refer to Section 3.14.7, “Collection” [76] for details on collection behaviors). If selecting an implementation the **Multiple** column value will automatically be set to 'Yes' if it hasn't been already. Note: There is a fourth implementation called Collection, that can only appear after importing e.g. a JavaBean. It can neither be set nor edited.
Description	The description for this row. You can edit cells in this column by double-clicking them.

Related References.

- Section 3.14.7, “Collection” [76]
- Section 5.6.6.3, “Internal Data” [245]
- Section 5.6.6.4, “Constant Data” [247]

5.6.6.3. Internal Data

This tab shows a list of all the internal data elements defined on the selected rule model, rule package or rule.

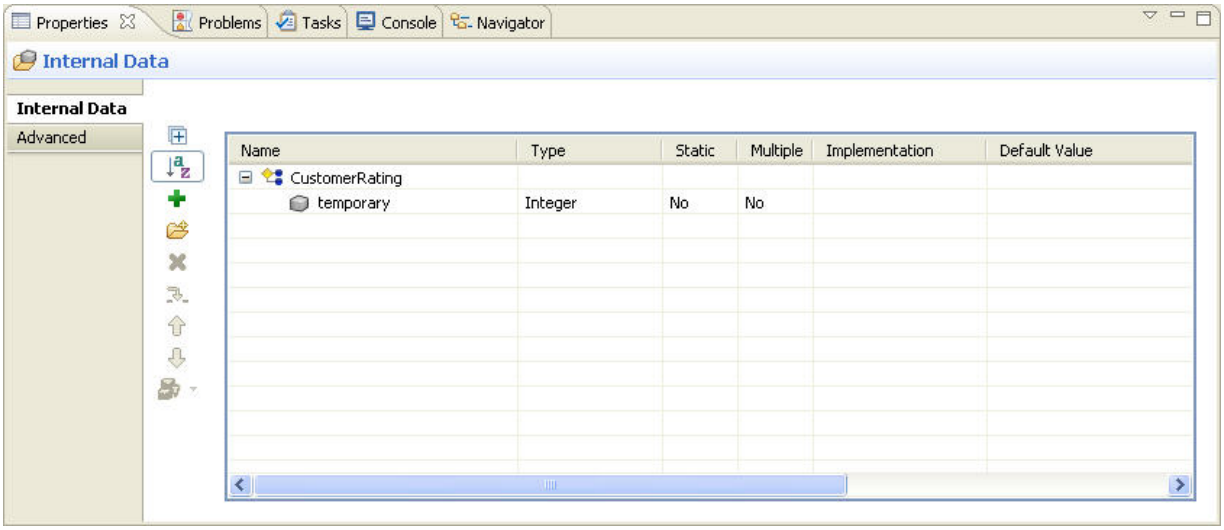


Figure 5.59. Internal Data tab

Icon	Description
	Initially all elements are collapsed. This button will expand them so that all elements are visible. This only has an effect if there is at least one element available.
	This button is used to toggle the alphabetically sorting of the elements.
	Adds a new Internal Data element.
	Creates a new group. This allows you to organize your data.
	Removes the currently selected element or group.
	Inserts another element to a collection, list or set. This is only available when the selected attribute is a collection, list or set.
	Allows manually changing the order of the elements. This is only applicable, if alphabetically sorting ( ) is turned off.
	Converts the selected element to either **Constant Data** or **Input/Output Data**.

Table Column	Description
Name	This column shows the name of the input/output data element. The first row shows the name of the element they are attached to. You can edit cells in this column except for the one in the first row by double-clicking them.
Type	The type of the data element. You can edit cells in this column by double-clicking them.
Static	This column shows wether the data element is static. You can edit cells in this column by double-clicking them.
Multiple	This column shows wether the data element holds a single or multiple values of this type. You can edit cells in this column by double-clicking them.

Table Column	Description
Implementation	In this column you can specify the collection implementation to be used for a data element that will have multiple entries. You can edit a cell by double-clicking on it. The behavior of the collection depends on the implementation type you select, which can be either of the following three types available: List, Set, or Map (refer to Section 3.14.7, “Collection” [76] for details on collection behaviors). If selecting an implementation the **Multiple** column value will automatically be set to 'Yes' if it hasn't been already. Note: There is a fourth implementation called Collection, that can only appear after importing e.g. a JavaBean. It can neither be set nor edited.
Default Value	The default value which will be used when you access the data element when no other value has been set. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

Related References.

- Section 3.14.7, “Collection” [76]
- Section 5.6.6.2, “Input/Output Data Tab” [244]
- Section 5.6.6.4, “Constant Data” [247]

5.6.6.4. Constant Data

This tab shows a list of all the constant data elements defined on the selected rule model, rule package or rule.

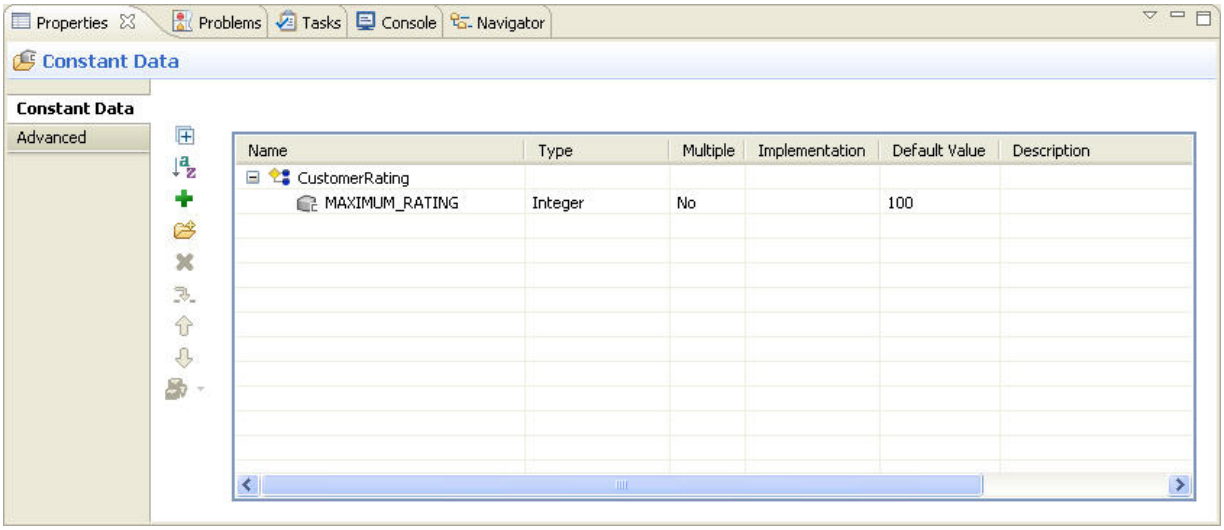


Figure 5.60. Constant Data tab

Icon	Description
	Initially all elements are collapsed. This button will expand them so that all elements are visible. This only has an effect if there is at least one element available.
	This button is used to toggle the alphabetically sorting of the elements.
	Adds a new Constant Data element.
	Creates a new group. This allows you to organize your data.

Icon	Description
	Removes the currently selected element or group.
	Inserts another element to a collection, list or set. This is only available when the selected attribute is a collection, list or set.
	Allows manually changing the order of the elements. This is only applicable, if alphabetically sorting ( ) is turned off.
	Converts the selected element to either **Internal Data** or **Input/Output Data**.

Table Column	Description
Name	This column shows the name of the input/output data element. The first row shows the name of the element they are attached to. You can edit cells in this column except for the one in the first row by double-clicking them.
Type	The type of the data element. You can edit cells in this column by double-clicking them.
Multiple	This column shows wether the data element holds a single or multiple values of this type. You can edit cells in this column by double-clicking them.
Implementation	In this column you can specify the collection implementation to be used for a data element that will have multiple entries. You can edit a cell by double-clicking on it. The behavior of the collection depends on the implementation type you select, which can be either of the following three types available: List, Set, or Map (refer to Section 3.14.7, “Collection” [76] for details on collection behaviors). If selecting an implementation the **Multiple** column value will automatically be set to 'Yes' if it hasn't been already. Note: There is a fourth implementation called Collection, that can only appear after importing e.g. a JavaBean. It can neither be set nor edited.
Default Value	The default value which will be used when you access the data element when no other value has been set. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

Related References.

- Section 3.14.7, “Collection” [76]
- Section 5.6.6.2, “Input/Output Data Tab” [244]
- Section 5.6.6.3, “Internal Data” [245]

5.6.7. Actions

The following properties tabs are available for actions.

5.6.7.1. Actions Tab

This tab is shown when a rule model, a rule package, a rule or an actions group is selected in the **Rule Explorer**. It allows you to specify the actions available for the given context.

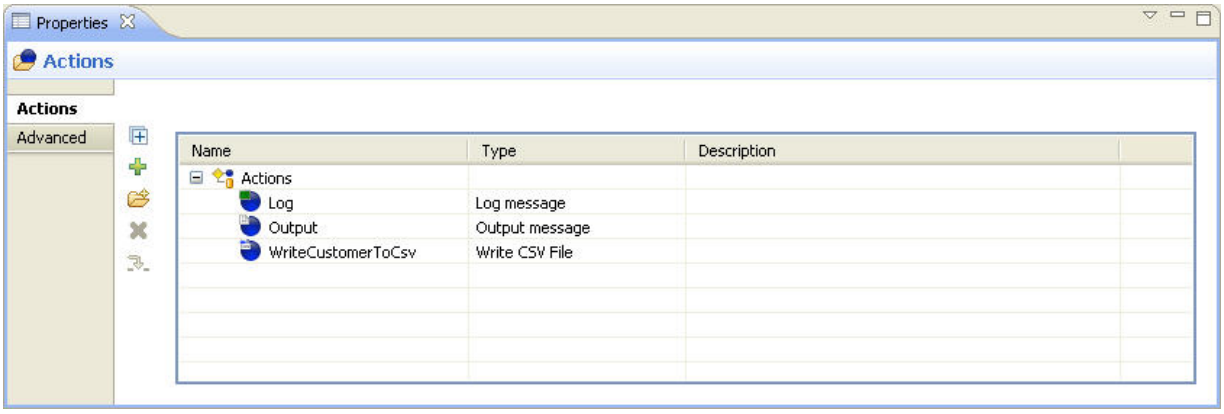


Figure 5.61. Actions tab

Icon	Description
	Initially all elements are collapsed. This button will expand them so all elements are visible. This only has an effect if there is atleast one element available.
	Adds a new action.
	Creates a new group. This allows you to organize your actions.
	Removes the currently selected action or group.

Table Column	Description
Name	This column shows the name of the action element. The first row shows the name of the element they are attached to. You can edit cells in this column except for the one in the first row by double-clicking them.
Type	The type of the action element. You can edit cells in this column by double-clicking them.
Description	The description for this row. You can edit cells in this column by double-clicking them.

5.6.7.2. Action Settings Tab

This tab is shown when an action is selected in the **Rule Explorer**. It allows you to adjust settings specific to the selected action type that are common for every invocation of the action.

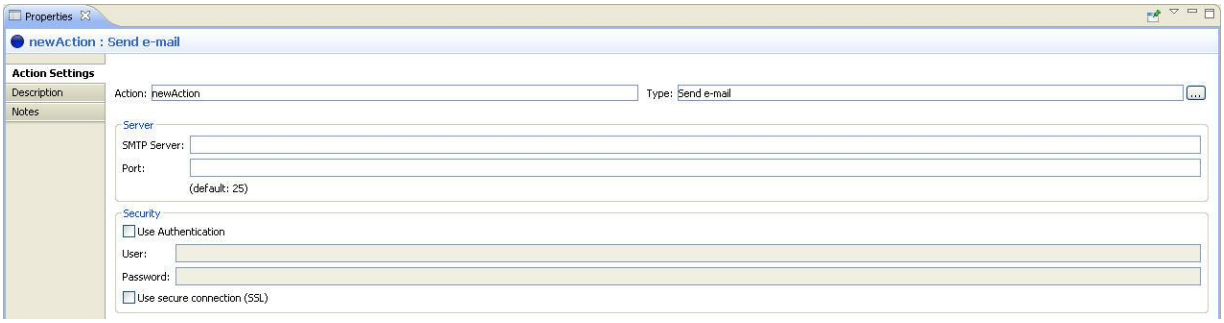


Figure 5.62. Action Settings tab

Option	Description
Action	Enter the name of the action.

Option	Description
Type	Enter the type of the action. Code Assist (**Ctrl**+**Space**) is available.
SMTP Server	Enter the host of the smtp server that should be used to send an e-mail.
Port	Enter the port of the smtp server.
Use Authentication	Check if you want to authenticate yourself.
User	Enter your username.
Password	Enter your password.
Use secure connection (SSL)	Check if you want your e-mails to be sent encrypted (via SSL).

5.6.7.3. Output message Action Tabs

This tab is shown when an "Output message" action is selected. Here you can specify where the output of the action should be written to.

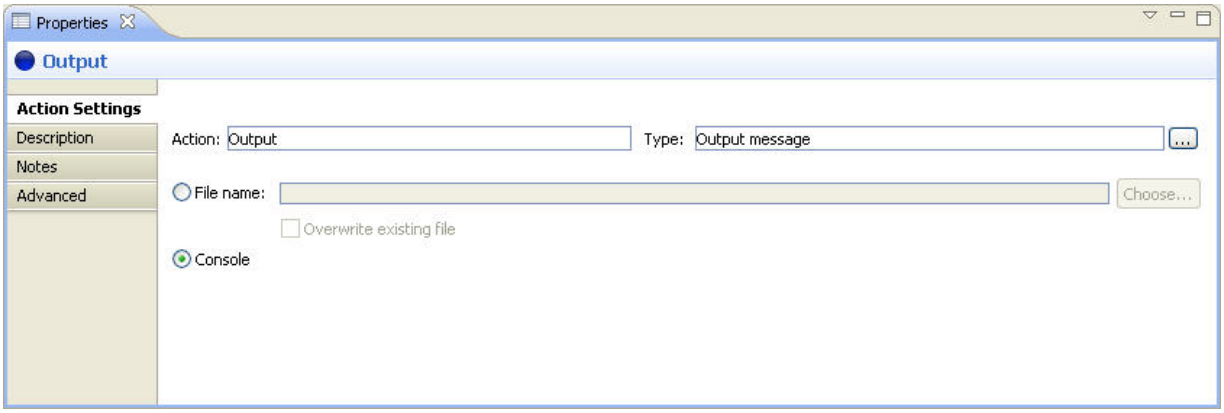


Figure 5.63. Output message Action tab

Option	Description
Action	Enter the name of the action.
Type	Enter the type of the action. Code Assist (**Ctrl**+**Space**) is available.
Filename	When you select this option you must specify the filename to which the output should be written to here.
Overwrite existing File	Check this option if you want every output to overwrite the existing file. When this option is not checked the output is appeneded.
Console	When you select this option the output is written to the console instead of a file.

The corresponding Fire Action tab is shown when an invocation of the action is selected in the rule editor. You can specify the output text here.

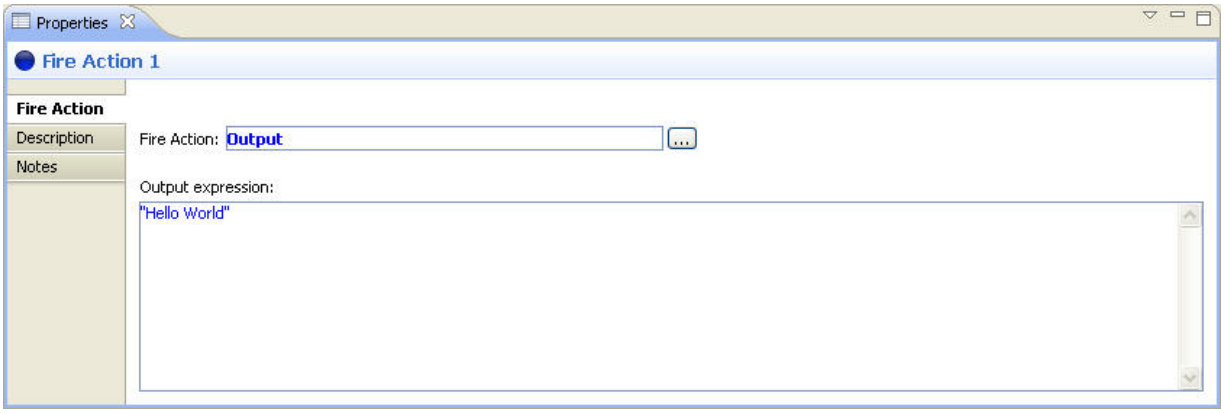


Figure 5.64. Fire Output message Action tab

Option	Description
Fire Action	Enter the name of the action that you want to fire. Code Assist (**Ctrl**+**Space**) is available.
Output expression	Enter the expression you want to output.

5.6.7.4. Log message Action Tab

This tab is shown when a "Log message" action is selected in the **Rule Explorer** or in the data ruler of the rule editor. In it you can specify which category the log messages belong to. Also

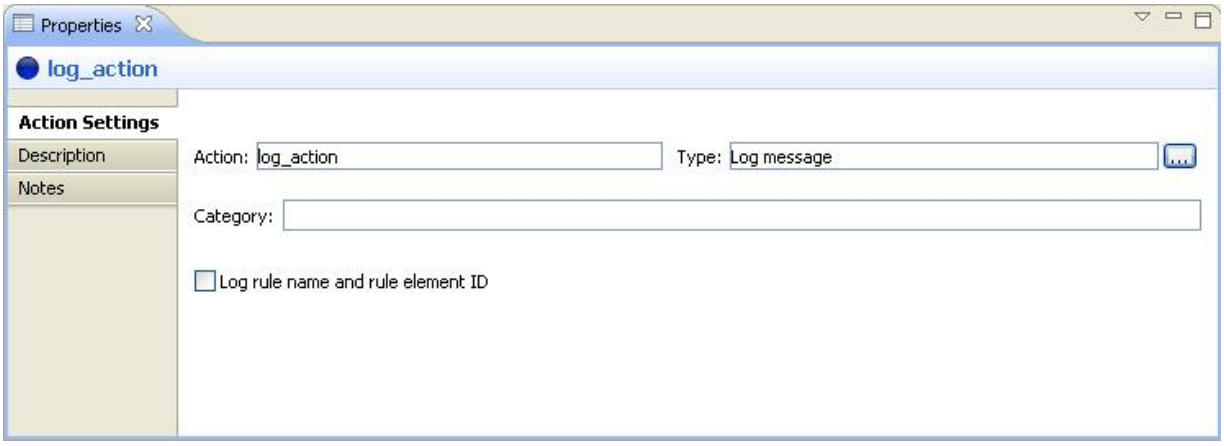


Figure 5.65. Log message Action tab

Option	Description
Action	Enter the name of the action.
Type	Enter the type of the action. Code Assist (**Ctrl**+**Space**) is available.
Category	Enter the category to which you want to log here.
Log rule name and rule element ID	Check if you want information on the path to and name of the executed rule and the rule element ID to be added in front of the log message.

The corresponding Fire Action tab is shown when an invocation of the action is selected in the rule editor. You can specify the log priority and message here.

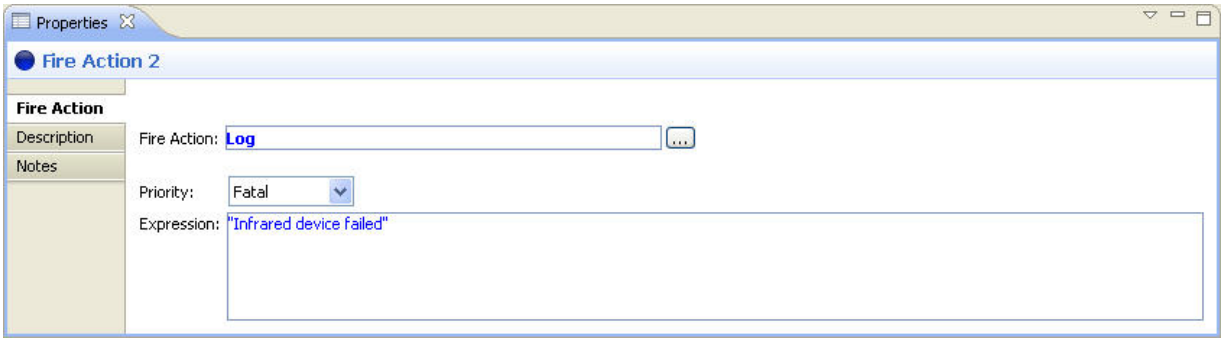


Figure 5.66. Fire Log message Action tab

Option	Description
Fire Action	Enter the name of the action that you want to fire. Code Assist (**Ctrl**+**Space**) is available.
Priority	Select the priority for the log message.
Output expression	Enter the expression you want to log.

5.6.7.5. Send e-mail Action Tabs

This tab is shown when a "Send e-mail" action is selected. Here you can specify what server to use for sending the e-mails.

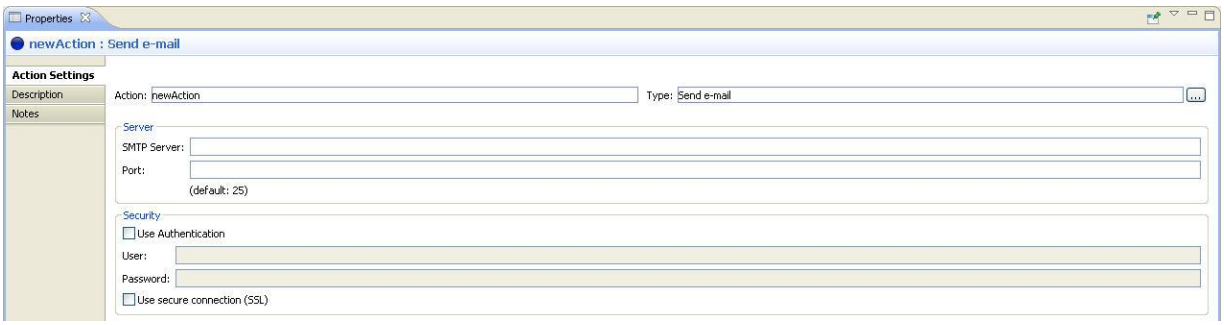


Figure 5.67. Send e-mail Action tab

Option	Description
Action	Enter the name of the action.
Type	Enter the type of the action. Code Assist (**Ctrl**+**Space**) is available.
SMTP Server	Enter the host of the smtp server that should be used to send an e-mail.
Port	Enter the port of the smtp server.
Use Authentication	Check if you want to authenticate yourself.
User	Enter your username.
Password	Enter your password.
Use secure connection (SSL)	Check if you want your e-mails to be sent encrypted (via SSL).

The corresponding Fire Action tab is shown when an invocation of the action is selected in the rule editor. You can configure the contents of the e-mail here.

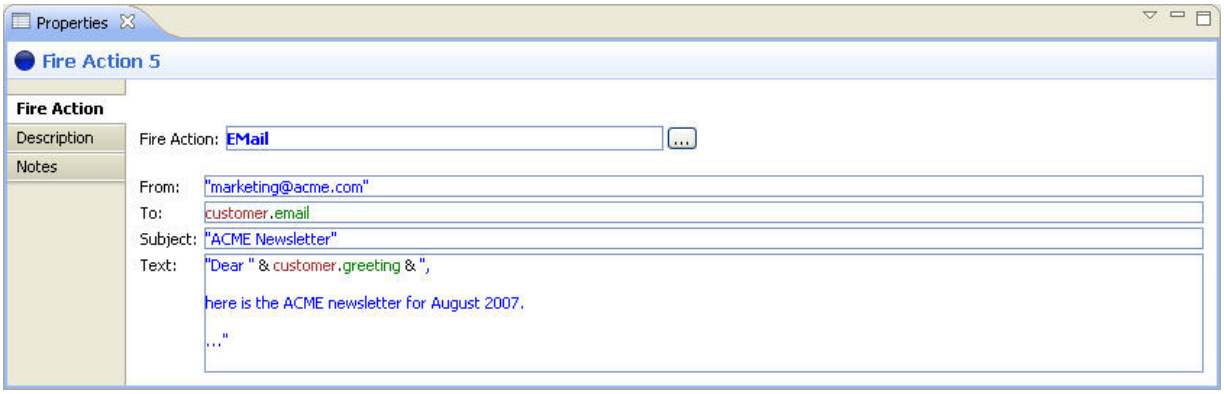


Figure 5.68. Fire Send e-mail Action tab

Option	Description
Fire Action	Enter the name of the action that you want to fire. Code Assist (**Ctrl**+**Space**) is available.
From	Enter the expression describing the from address of the e-mail.
To	Enter the expression describing the to address of the e-mail.
Subject	Enter the expression describing the subject of the e-mail.
Text	Enter the expression describing the text of the e-mail.

5.6.7.6. Write CSV File Action Tabs

This tab is shown when a "Write CSV File" action is selected. Here you can configure the layout of the CSV file that will be written.

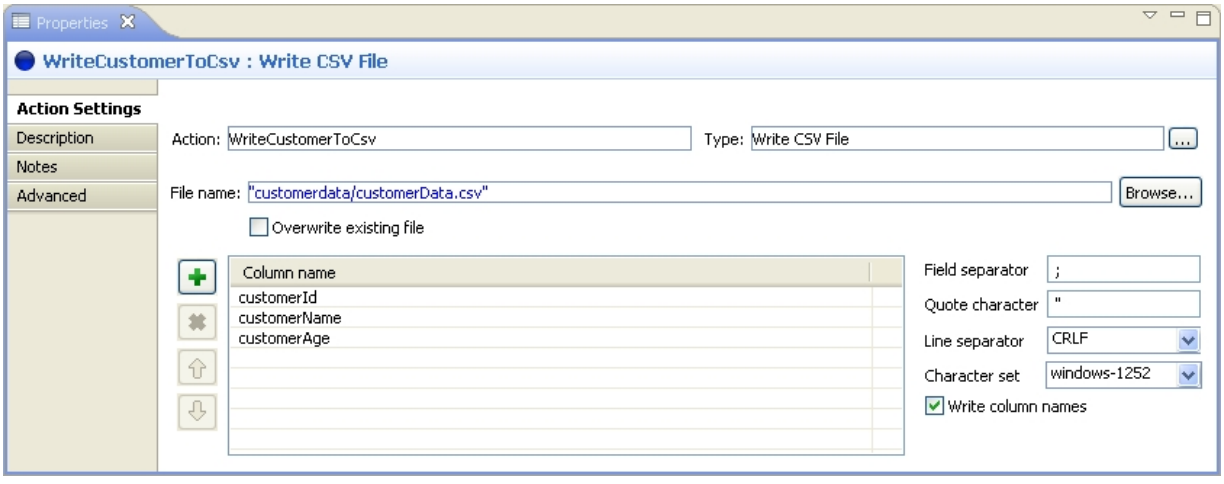


Figure 5.69. Write CSV File Action tab

Option	Description
Action	Enter the name of the action.
Type	Enter the type of the action. Code Assist (**Ctrl**+**Space**) is available.
File name	Enter the file name of the CSV file that will be written.
Overwrite existing file	Check this option if you want every output to overwrite the existing file. When this option is not checked the output is appended.
Field separator	Enter the separator that should be used between the columns.

Option	Description
Quote character	Enter the character that will act as a quotation start/end identifier.
Line Separator	Choose the line separator. You can choose between **CRLF** which is the Windows line separator, **LF** the Unix line separator and **CR** the Mac line separator.
Character set	Choose the character set that you want the file to be written with.
Write column names	Check this if you want the column names to be written as the first row in the CSV file.

Table Column	Description
Column name	This column shows the column names. You can edit cells in this column by double-clicking them.

Icon	Description
	Adds another column.
	Removes the currently selected column.
	Moves the currently selected column up one position within the list.
	Moves the currently selected column down one position within the list.

The corresponding Fire Action tab is shown when an invocation of the action is selected in the rule editor. Here you can define the values that will be written to each column.

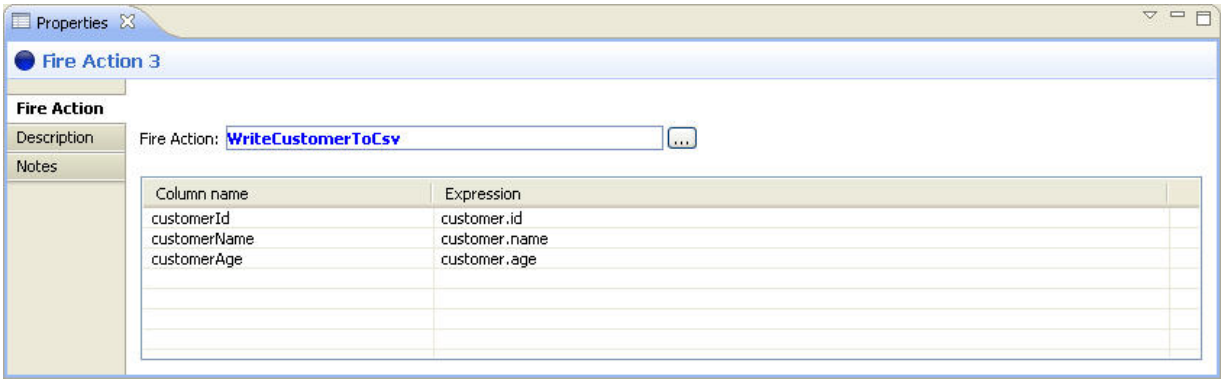


Figure 5.70. Fire Write CSV File Action tab

Option	Description
Fire Action	Enter the name of the action that you want to fire. Code Assist (**Ctrl**+**Space**) is available.
Column name	This column shows the column names. Cells in the column are read-only. If you want to change the column name please do it on the **Action Settings** tab.
Expression	This is the expression you are assigning to the specific column. You can edit cells in this column by double-clicking them.

5.6.7.7. Read CSV File Action Tabs

This action type is only available when the **Visual Rules 3.x compatibility functions/actions** have been activated for a rule model. See the **Extensions** tab of the rule model for this setting.

The "Read CSV file" action does not have any settings. All settings are done on the Fire Action tab, which is shown when an invocation of the action is selected in the rule editor.

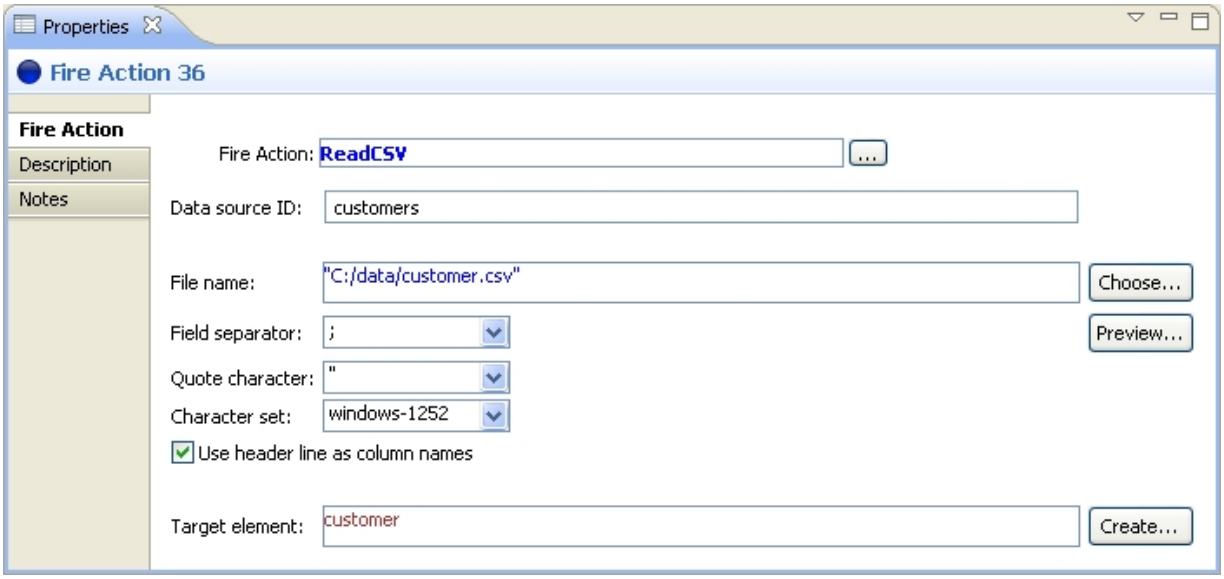


Figure 5.71. Fire Read CSV File Action tab

Option	Description
Fire Action	Enter the name of the action that you want to fire. Code Assist (**Ctrl**+**Space**) is available.
Data source ID	Enter an ID representing the CSV file. This ID is used when calling the `next()` function in order to repeatedly read the next record (line) from the file.
File name	Enter the file name of the CSV file that will be read. Click on **Choose...** to open a file browser.
Field separator	Select the separator that is used between the columns. Click on **Preview...** to open a dialog showing the CSV file contents. This lets you check if the current settings for the separator and quote character work properly.
Quote character	Enter the character that acts as a quotation start/end identifier.
Character set	Select the character set of the file.
Use header line as column names	Check this if the first line in the CSV file contains the column names.
Target object	Specify a data element that will hold each record (line) of the CSV file. This object must have attributes whose names match with the column names. It is set to the next record every time the `next()` function is called with the specified data source id (see above). Click on **Create...** to automatically create both a data type and a data element to hold each record. If the CSV file contains column names in the first line, these will be used as the names for the attributes of the created data type.

Related References.

- Section 5.6.4.1, “Extensions tab” [241]

5.6.8. Data Types

The following sections describe the properties tabs available for the different kinds of data types like structures, type aliases, enumerations and exceptions.

5.6.8.1. Data Types Tab

This tab is shown when an element that contains data types like a rule model, a rule package or a rule is selected in the **Rule Explorer**. You can edit the data types here.

Note that this tab has four sub tabs for **Structures**, **Enumerations**, **Exceptions** and **Type Aliases**.

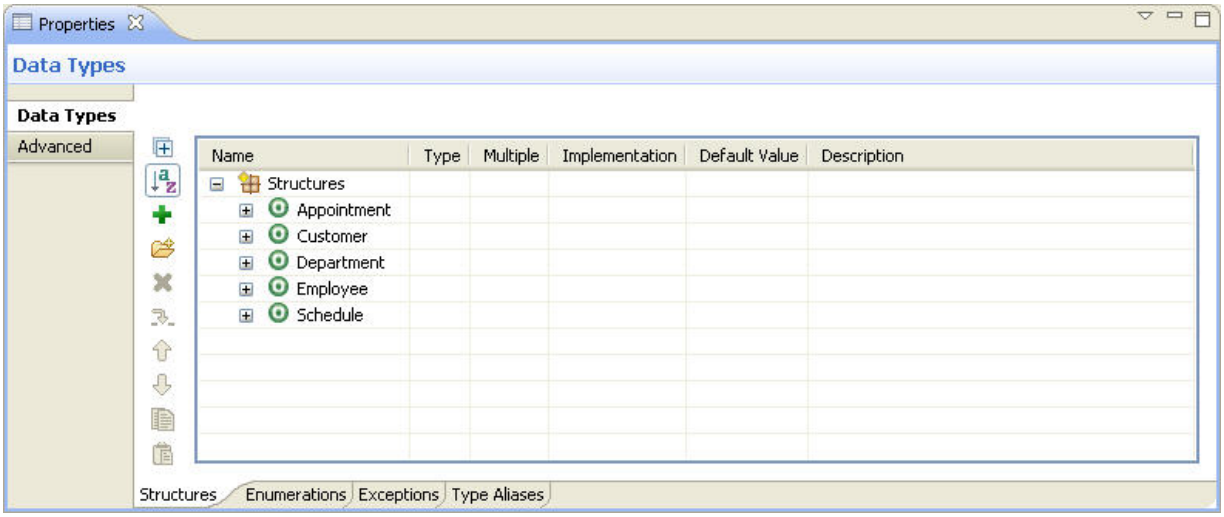


Figure 5.72. Data Types tab

Icon	Description
	Initially all elements are collapsed. This button will expand them so that all elements are visible.
	Adds a new data type. The data type created depends on the sub tab (at the bottom) you are in.
	Creates a new group. This allows you to organize your data types.
	Removes the currently selected data type or group.
	Inserts another element to a collection, list or set. This is only available when the selected attribute of a data type is a collection, list or set.

Table Column	Description
Name	This column shows the name of the data types. The first row shows the name of the element containing the data types. The subsequent rows show child elements that also contain data types but are not data types themselves. After that direct children of this element that are actually data types are shown. You can edit cells in this column by double-clicking them only if they are data types or groups - not elements that can also contain something else than data types like rule models, rule packages or rules.
Type	The type of the parameter. You can edit cells in this column by double-clicking them.
Multiple	This column shows whether the data element holds a single or multiple values of this type. You can edit cells in this column by double-clicking them.
Implementation	In this column you can specify the collection implementation to be used for a data element that will have multiple entries. You can edit a cell by double-clicking on it. The behavior of the collection depends on the implementation type you select, which can be either of the following three types available: List, Set, or Map (refer to Section 3.14.7, “Collection” [76] for details on collection behaviors). If selecting an implementation the **Multiple** column value will automatically be set to 'Yes' if it hasn't been already. Note: There is a fourth implementation called Collection, that can only appear after importing e.g. a JavaBean. It can neither be set nor edited.

Table Column	Description
Default Value	The default value which will be used when you access the data element when no other value has been set. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

5.6.8.2. Type Alias Tab

This tab is shown when an alias is selected in the **Rule Explorer**.

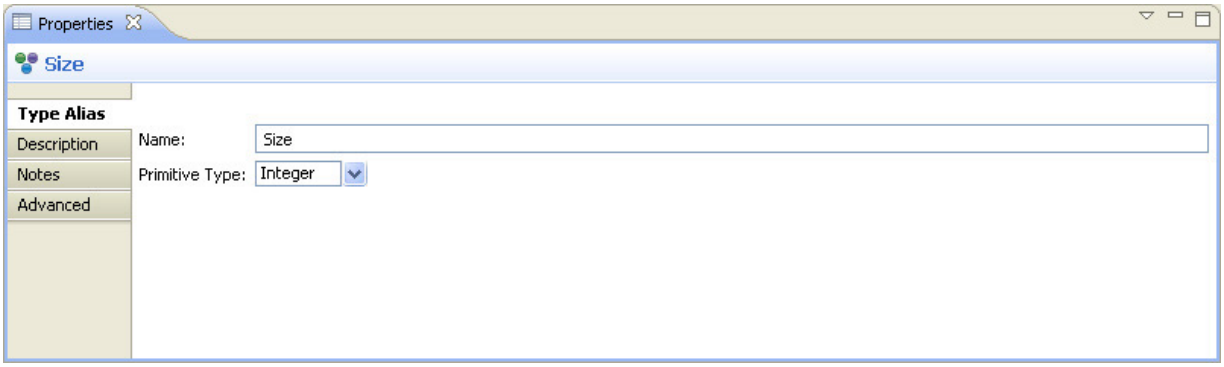


Figure 5.73. Type Alias tab

Option	Description
Name	Enter the name of the alias.
Primitive Type	Enter the name of the primitive type the alias is for.

5.6.8.3. Attributes Tab

This tab is shown when an enumeration, exception or structure type is selected in the **Rule Explorer**.

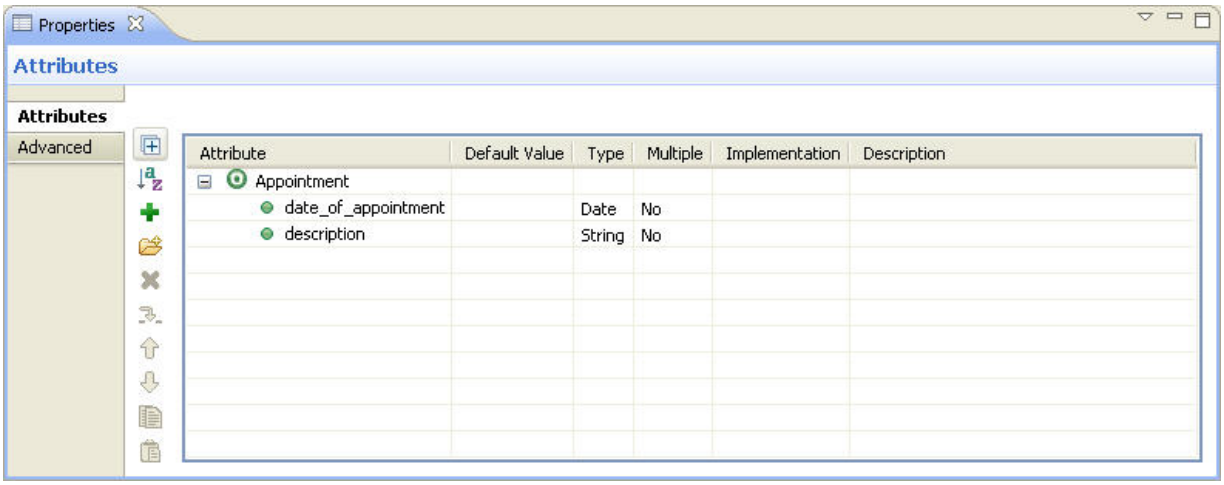


Figure 5.74. Attributes tab

Icon	Description
	Initially all elements are collapsed. This button will expand them so that all elements are visible. This only has an effect if there is at least one element available.

Icon	Description
	Adds another attribute.
	Creates a new group. This allows you to organize your attributes.
	Inserts another element to an attribute that is a collection, list or set. This is only available when the currently selected attribute is a collection, list or set.
	Removes the currently selected attribute or group.
	Moves the currently selected attribute up one position within the list.
	Moves the currently selected attribute down one position within the list.

Table Column	Description
Attribute	This column shows the attributes of the selected datatype. You can edit cells in this column by double-clicking them if the cell contains an attribute of the selected element. If one of the attributes is another complex datatype like a structure, exception or enumeration and you want to edit the attributes of that datatype please do so in the respective properties tab of that datatype.
Default Value	The default value which will be used when you access the data element when no other value has been set. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Type	The type of the data element. You can edit cells in this column by double-clicking them.
Multiple	This column shows whether the data element holds a single or multiple values of this type. You can edit cells in this column by double-clicking them.
Implementation	In this column you can specify the collection implementation to be used for a data element that will have multiple entries. You can edit a cell by double-clicking on it. The behavior of the collection depends on the implementation type you select, which can be either of the following three types available: List, Set, or Map (refer to Section 3.14.7, “Collection” [76] for details on collection behaviors). If selecting an implementation the **Multiple** column value will automatically be set to 'Yes' if it hasn't been already. Note: There is a fourth implementation called Collection, that can only appear after importing e.g. a JavaBean. It can neither be set nor edited.
Description	The description for this row. You can edit cells in this column by double-clicking them.

5.6.8.4. Constant Data Tab

This tab is shown when an element that has constant data elements like an enumeration, exception or structure type is selected in the **Rule Explorer**.

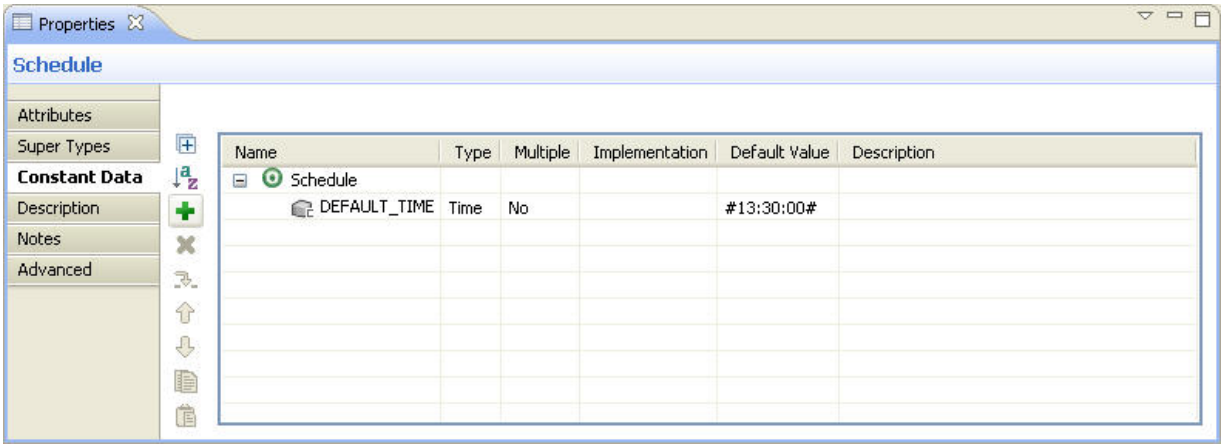


Figure 5.75. Constant Data tab

Icon	Description
	Initially all elements are collapsed. This button will expand them so that all constant elements are visible. This only has an effect if there is at least one element available.
	Adds another constant data element.
	Creates a new group. This allows you to organize your constant data elements.
	Inserts another element to an constant data element that is a collection, list or set. This is only available when the currently selected constant data element is a collection, list or set.
	Removes the currently selected attribute or group.
	Moves the currently selected constant data element up one position within the list.
	Moves the currently selected constant data element down one position within the list.

Table Column	Description
Name	This column shows the constant data elements available on the selected element. You can edit cells in this column by double-clicking them.
Type	The type of the data element. You can edit cells in this column by double-clicking them.
Multiple	This column shows whether the data element holds a single or multiple values of this type. You can edit cells in this column by double-clicking them.
Implementation	In this column you can specify the collection implementation to be used for a data element that will have multiple entries. You can edit a cell by double-clicking on it. The behavior of the collection depends on the implementation type you select, which can be either of the following three types available: List, Set, or Map (refer to Section 3.14.7, “Collection” [76] for details on collection behaviors). If selecting an implementation the **Multiple** column value will automatically be set to 'Yes' if it hasn't been already. Note: There is a fourth implementation called Collection, that can only appear after importing e.g. a JavaBean. It can neither be set nor edited.
Default Value	The default value which will be used when you access the data element when no other value has been set. You can edit cells in this column by double-clicking them. Code Assist (**Ctrl**+**Space**) is available.
Description	The description for this row. You can edit cells in this column by double-clicking them.

5.6.8.5. Literals Tab

This tab is shown when an enumeration is selected in the **Rule Explorer**.

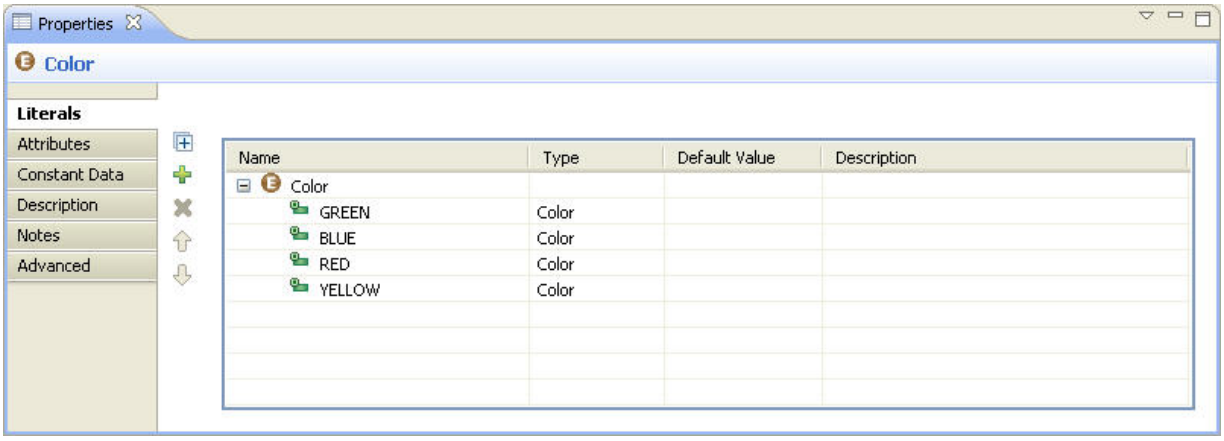


Figure 5.76. Literals tab

Icon	Description
	Adds another literal.
	Removes the currently selected literal.
	Moves the currently selected literal up one position within the list.
	Moves the currently selected literal down one position within the list.

Table Column	Description
Name	This column shows the constant data elements available on the selected element. You can edit cells in this column by double-clicking them.
Type	The type of the data element. This column is readonly as literals are always the type of the literal and the type of attributes has to be changed in the attributes tab.
Default Value	When your enumeration has attributes you can specify default values for an attribute for the given literal here. You can edit cells in this column by double-clicking them.
Description	The description for this row. You can edit cells in this column by double-clicking them.

5.6.8.6. Super Types Tab

This tab is shown when a structure or an exception is selected.

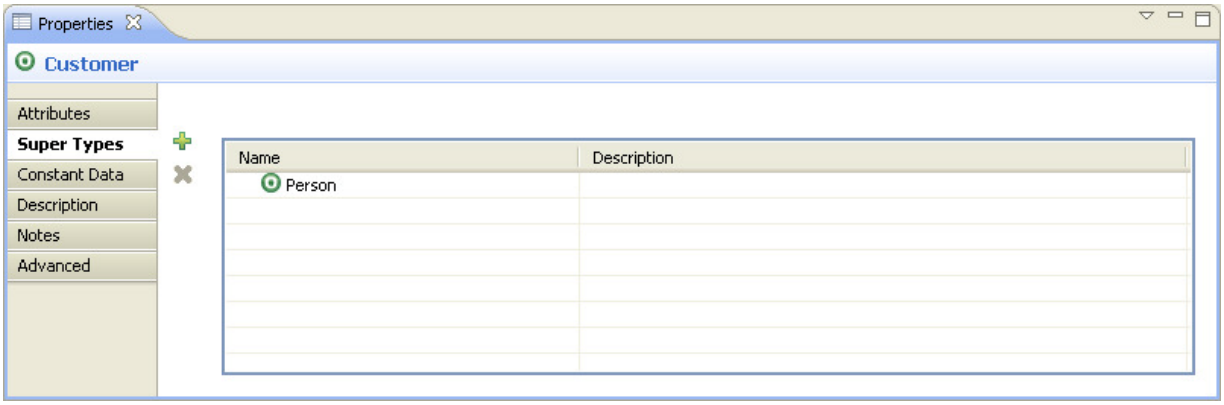


Figure 5.77. Super Types tab

Icon	Description
	Adds another super type.
	Removes the selected super type. Technical note: For imported data types this is only possible if the selected super type is an interface.

5.6.9. Meta Data

Meta data can be used to extend Visual Rules domain-specifically. For more Information see the Java Integration Guide.

5.6.9.1. Meta Data Tab

This tab is shown when input/output data, constant data, data structures, attributes, rule models, rule packages or rules are selected in the rule editor. This tab is used to view and edit meta data.

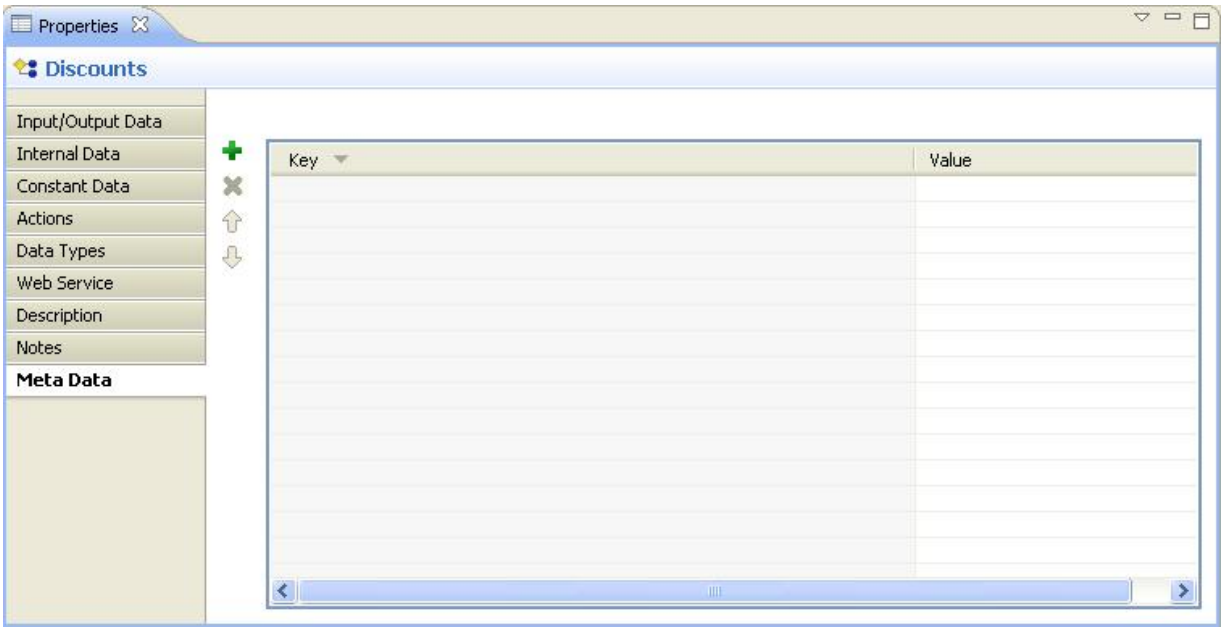


Figure 5.78. Meta Data tab

Icon	Description
	Adds more meta data.
	Removes the corresponding meta data.

5.7. Preferences

The following sections describe the Visual Rules specific pages available in the **Preferences** dialog in the Visual-Rules section. The **Preferences** dialog can be opened with the menu **Window > Preferences...**.

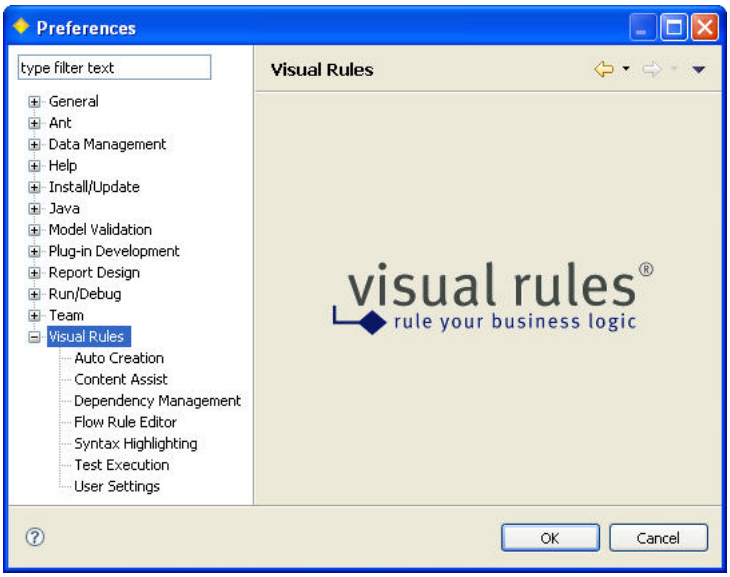
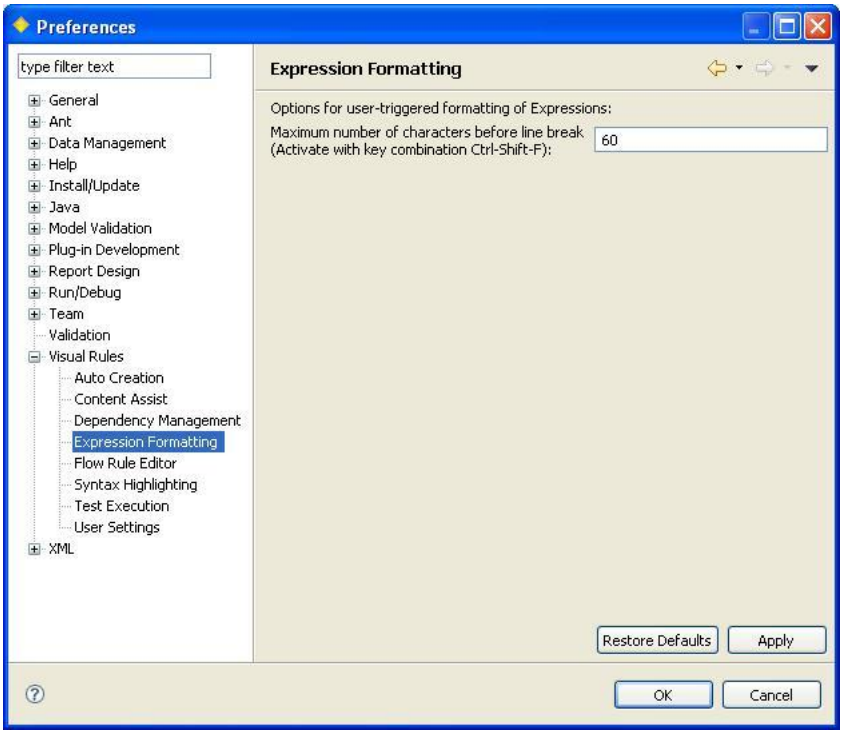


Figure 5.79. Preferences dialog

5.7.1. Expression Formatting Preferences

The expression formatting page contains the settings for the formatting of expressions in Visual Rules.



Option	Description
Maximum number of characters before line break	This is the maximum number of characters in an expression, after which automatically a line break is inserted (if possible). To activate the automatic line break, you need to press **Ctrl-Shift-F**.

5.7.2. Flow Rule Editor Preferences

This preferences page contains settings for the flow rule editor.

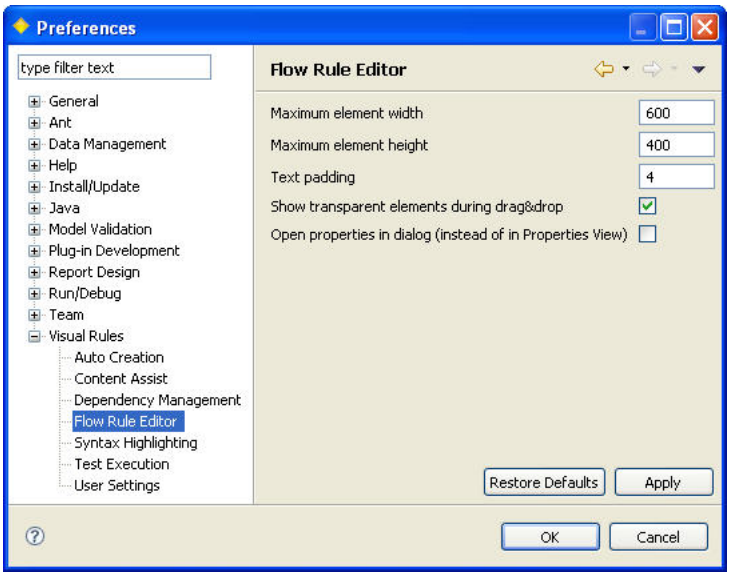


Figure 5.80. Flow Rule Editor preferences

Option	Description
Maximum element width	This is the maximum width in pixels for all rule elements. If descriptions or contents are longer than this, they will be wrapped.

Option	Description
Maximum element height	This is the maximum height in pixels for all rule elements. If descriptions or contents are longer than this, they will not be fully displayed. An ellipsis (...) is displayed to indicate this.
Text padding	This is the amount of padding (in pixels) done around descriptions and contents.
Show transparent elements during drag&drop	Enable this to display a transparent image of the rule element(s) being moved during drag&drop. You may want to disable this if it slows down your computer considerably.
Open properties in dialog (instead of in Properties View)	When enabled, double-clicking a rule element in the flow rule editor will open the properties in a dialog. This is useful when working in a maximized flow rule editor. Otherwise the properties will be displayed in the usual Properties view.

Related Concepts.

- Section 3.6, “Flow Rule Editor” [45]

5.7.3. Auto Creation Preferences

This preferences page contains settings for the auto generation of rule elements.

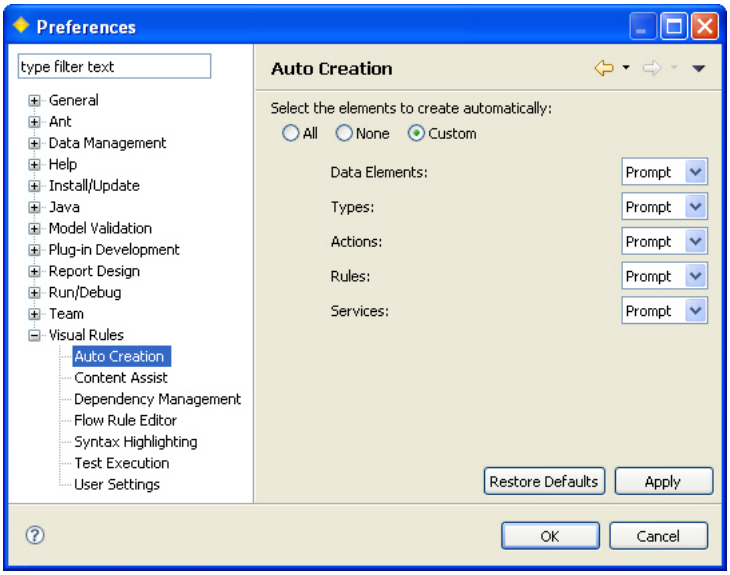


Figure 5.81. Auto Creation preferences

Option	Description
All	Enable this to let Visual Rules automatically create any elements you are referring to that do not exist yet.
None	Enable this so Visual Rules will never automatically create any elements.
Custom	Enable this so you can specifically choose what elements should be auto created.

If you select **Custom** you can make the decision on the auto creation policy based on the element that would be auto created.

Option	Description
Data Elements	Select the policy for auto creation of data elements.
Types	Select the policy for auto creation of types.

Option	Description
Actions	Select the policy for auto creation of actions.
Rules	Select the policy for auto creation of rules.
Services	Select the policy for auto creation of services.

Option	Description
Prompt	Enable this so Visual Rules will ask you every time when an element of the specific element type should be created.
Always	Enable this to let Visual Rules automatically create any elements of this type you are referring to that do not exist yet.
Never	Enable this so Visual Rules will never automatically create any elements of this specific type.

Related Concepts.

- Section 3.21, “Auto Creation” [82]

Related Tasks.

- Section 4.10.3, “Working with Auto Creation” [159]

Related References.

- Section 5.4.3, “Auto Creation Dialog” [218]

5.7.4. Syntax Highlighting Preferences

This preferences page contains settings for the colors used for syntax highlighting in expression editors.

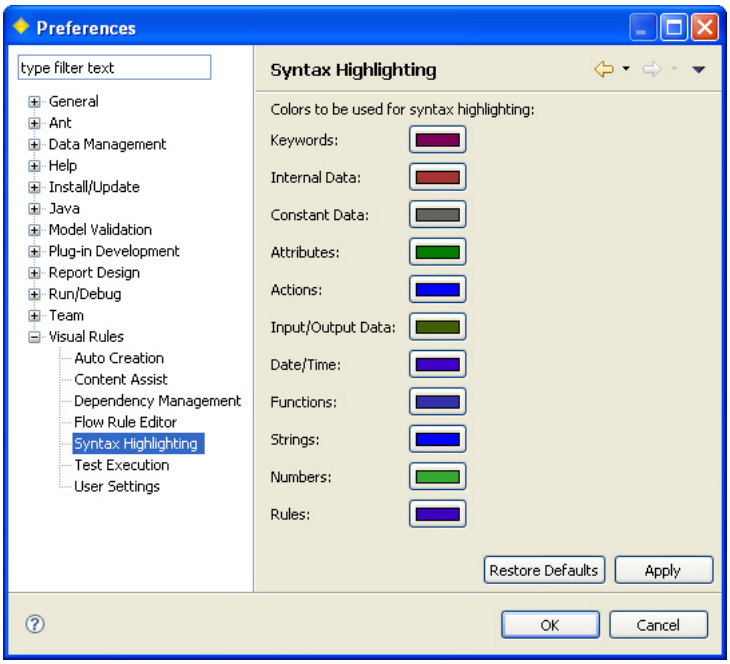


Figure 5.82. Syntax Highlighting preferences

Option	Description
Keywords	Choose the color used for displaying keywords in an expression editor.

Option	Description
Variables	Choose the color used for displaying variables in an expression editor.
Constants	Choose the color used for displaying constants in an expression editor.
Attributes	Choose the color used for displaying attributes in an expression editor.
Actions	Choose the color used for displaying actions in an expression editor.
Parameters	Choose the color used for displaying parameters in an expression editor.
Date/Time	Choose the color used for displaying date/time in an expression editor.
Functions	Choose the color used for displaying functions in an expression editor.
Strings	Choose the color used for displaying strings in an expression editor.
Numbers	Choose the color used for displaying numbers in an expression editor.

5.7.5. Colors and Fonts Preferences

This preference page is used to configure many of the colors and font settings for the user interface. The tree contains a **Visual Rules** section with the fonts used in the rule editor and the properties tabs.

Font settings can be changed either by selecting the font from the list and clicking **Use System Font** to choose the default system font or by clicking **Change** to open up a font selection dialog. **Reset** can be used to return to the default value.

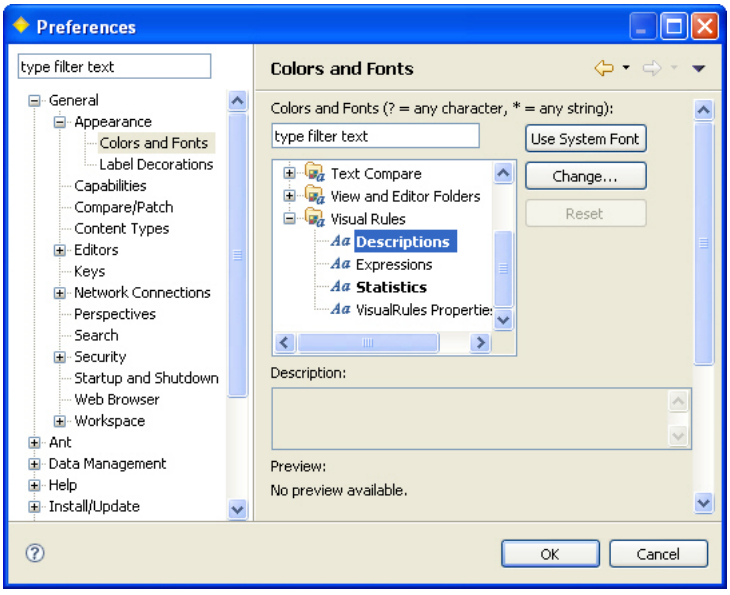


Figure 5.83. Colors and Fonts preferences

5.7.6. Test execution

This preference page contains settings for the execution of tests.

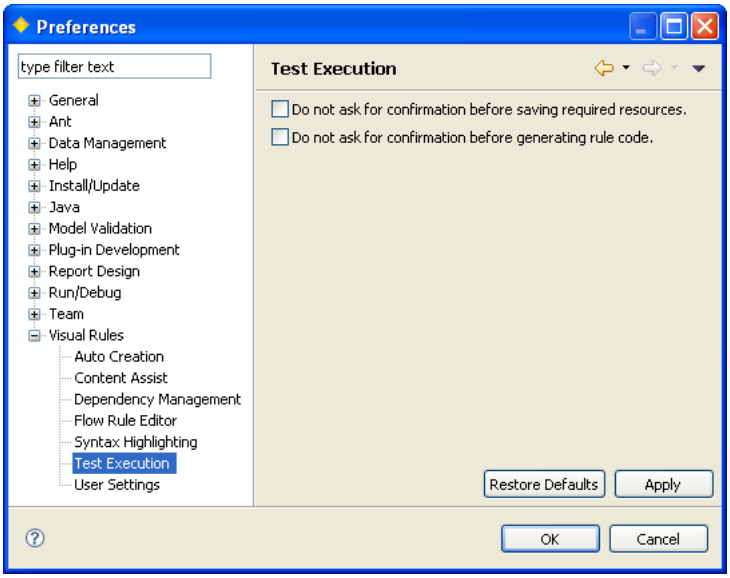


Figure 5.84. Test execution preferences

Option	Description
Do not ask for confirmation before saving required resources.	Toggles a dialog which appears on test execution, showing the resources that need to be saved in order to proceed.
Do not ask for confirmation before generating rule code.	This setting toggles if Visual Rules should show all resources that are required to be generated for the test execution.

When one of the mentioned popup dialogs appears on execution, the corresponding setting can be directly set on the dialog.

5.7.7. Validation

The validation page contains the settings for the automatic validation of rule projects in Visual Rules.

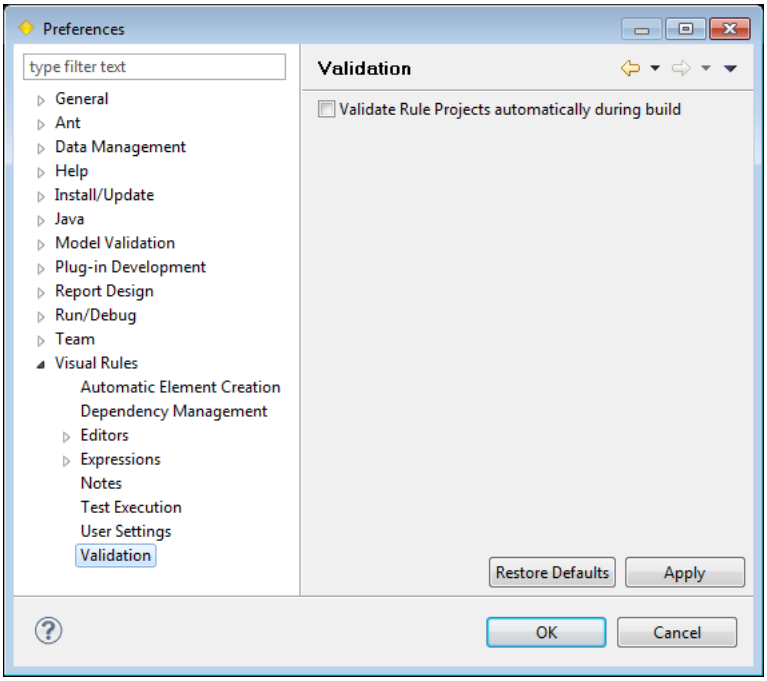


Figure 5.85. Validation preferences

Option	Description
Validate Rule Projects automatically during build	If activated, rule projects are automatically validated during build.

You can manually start the validation of selected rule projects with the button in the toolbar.

5.7.8. Notes Preferences

This preference page is used to define different categories of notes with different settings, e.g. whether or not for a note a corresponding task is automatically created. Here some predefined categories are provided by default.

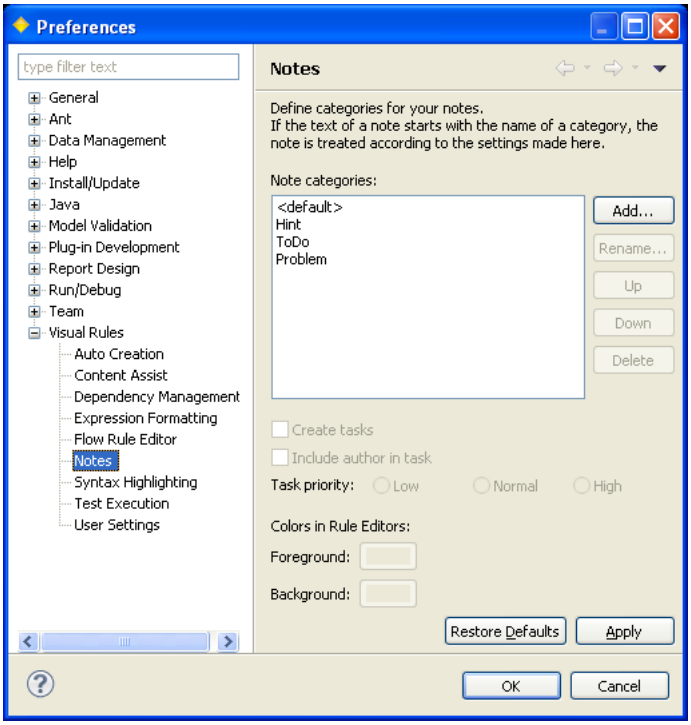


Figure 5.86. Notes preferences

If the text of a note starts with the name of a defined category, then the note is automatically considered to be of that category and the related settings are applied.

5.8. Hotkeys

The following hotkeys can be used in the rule editor.

Table 5.1. Rule Editor hotkeys

Key	Function
Cursor keys	Navigate between rule elements
Alt+Cursor down	Navigate into and down within a rule element
Space	Expand/collapse rule elements
+	Expand rule element
-	Collapse rule element
Del	Delete the branch rooted at the currently selected element
Alt+Del	Delete the currently selected element only
Ctrl+S	Save the rule
Ctrl+Z	Undo last change
Ctrl+Y	Redo last change undone with **Ctrl+Z**
A	Create Assignment Rule Element
R	Create Call Flow Rule Rule Element
S	Create Call Service Rule Element
D	Create Decide Rule Element
B	Create Describe Branch Rule Element
E	Create Done & Return Rule Element
N	Create End Repeat Rule Element
F	Create Fire Action Rule Element
H	Create Handle Exception Rule Element
Z	Create Note
T	Create Repeat Rule Element
X	Create Return Exception Rule Element
Ctrl+Up	Decrease max height of rule elements
Ctrl+Left	Decrease max width of rule elements
Ctrl+L	Go to Rule Element
Ctrl+Down	Increase max height of rule elements
Ctrl+Right	Increase max width of rule elements
Ctrl+Shift+Home	Reset size
Ctrl+Alt+R	Brings up the Open Rule Dialog
F2	Rename selected element

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